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AN ACCOUNT OF SOME SOCIETIES AT AMSTERDAM AND HAMBURGH FOR THE RECOVERY OF DROWNED PERSONS, AND OF SIMILAR INSTITUTIONS AT VENICE, MILAN, PADUA, VIENNA, AND PARIS;

WITH A
COLLECTION OF AUTHENTIC CASES,
PROVING THE PRACTICABILITY OF EXTENDING THE
BENEFITS OF THEIR PRACTICE
TO THE RECOVERY OF PERSONS VISIBLY DEAD
BY SUDDEN STOPPAGES OF BREATH, SUFFOCATION,
STIFLING, SWOONING, CONVULSIONS,
AND OTHER ACCIDENTS.

By ALEXANDER JOHNSON, M. D.

When any Diſcovery of real Utility to the World is made, it is the Duty of every Man to render it as univerſally known and beneficial as poſſible.

[Price Two Shillings.]

TO THE READER.

THE deſign of this Publication is to ſhew, by authentic accounts from different States in Europe, that of a number of perſons now daily periſhing by accidents of various kinds, the greater part are capable of being ſaved by proper means duly applied.

The accidents that produce appearances of ſudden death, are two-fold: they are either ſuch as proceed from External Cauſes, as drowning, hanging, ſtoppages of breath by noxious vapours and otherwiſe; or from Internal Diſorders, as apoplexies, ſwoonings, convulſions, and ſtifling.

The many Caſes publiſhed of drowned perſons, has put the ſucceſs of ſuch recoveries beyond doubt: and the inſtances of recoveries in other accidents, though fewer in number, yet are ſufficient to ſhew, that much ſucceſs is to be expected in them, when the manner of adminiſtering relief is more generally known. The large field opened by theſe diſcoveries, and a few caſes already attended with ſucceſs, afford great hopes that aſſiſtance may often be effectually given in diſorders proceeding from internal cauſes.

To render theſe benefits as extenſive as poſſible, it is the Author's intention, provided his deſign meets with Public Encouragement, to publiſh Inſtructions for the proper Treatment in the ſeveral accidents where he apprehends relief may be adminiſtered.

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A

SHORT ACCOUNT

OF A

SOCIETY

AT AMSTERDAM

Inſtituted in the Year 1767

FOR THE RECOVERY OF DROWNED PERSONS;

WITH OBSERVATIONS

Shewing the Utility and Advantage that would accrue to GREAT BRITAIN from a ſimilar Inſtitution

EXTENDED TO

CASES OF SUFFOCATION BY DAMPS IN MINES, CHOAKING, STRANGLING, STIFLING, AND OTHER ACCIDENTS:

By ALEXANDER JOHNSON, M. D.

LONDON:

Sold by *John Nourſe*, in the Strand; *S. Leacroft*, at Charing-Croſs; *J. Robſon*, in New Bond-Street; *L. Davis*, in Holbourn; *J. Wilkie*, in St. Paul's Church-Yard; and *Richardſon* and *Urquhart*, under the Royal-Exchange.

MDCCLXXIII.

A SHORT ACCOUNT OF A SOCIETY FOR THE Recovery of DROWNED PERSONS, AND FOR Such as are Suffocated by DAMPS in MINES, or ſeemingly deprived of Life, by STIFLING, STRANGLING, and other Accidents.

OF the various Inſtitutions formed for the Welfare of Mankind, none appear more worthy of attention, than thoſe that are calculated for Preſerving the Human Species. In the year 1767 a few wealthy Gentlemen of the City of

Amſterdam, ſtruck with the variety of inſtances in which perſons falling into the water were loſt for want of proper treatment, when brought on ſhore, formed themſelves into a Society *for the Recovery of Drowned Perſons.* Theſe Gentlemen have purſued their deſign with ſo much zeal and ſucceſs, that in the ſpace of four years they had the ſatisfaction to find, that in not leſs than a Hundred and Fifty caſes, drowned perſons were recovered by the means pointed out by them and recommended in the United Provinces by advertiſements and other publications. Their Firſt Object was, to inform the common people, as well as the inferior practiſers of phyſic, in what manner to treat a perſon apparently lifeleſs: and their Second, was to animate them by proper rewards to purſue the methods recommended.

In the Inſtructions publiſhed upon that occaſion, they gave caution, in the firſt place, to forbear from practices very common in moſt countries; ſuch as rolling the body over a caſk; tying it up by the legs, with the head downwards; and all other rough uſage, intended to diſgorge water, vulgarly imagined to be ſwallowed by the drowned perſon. And they directed, firſt, to force air into the body, either at the mouth, or up the inteſtines; recommending the ſtimulating vapour of tobacco as more efficacious than common air: and, in the next place, to ſtrip off the wet clothes; and as ſoon as poſſible, to apply external heat to the body, by means of fire, of friction with flannel cloths, or the natural warmth of two perſons in bed, taking the body between them. They directed rubbing the body all over, eſpecially along the back bone, with woollen cloths wetted with brandy, and ſtrewed over with dry ſalt; and the chaffing the temples with a volatile ſpirit, and holding the ſame to the noſe.

The Rewards publiſhed by them for attempting the recovery of a drowned perſon, were the ſum of Six Ducats, or a Gold Medal, over and above all expences attending the ſame, not exceeding Four Ducats.

The great ſucceſs of this undertaking, and the advantages accruing from it to the State, has induced each of the ſeveral Provinces of the Republic of the Low Countries to take proper meaſures for extending the benefits of it, by enjoining an obſervance of the Society's directions through their reſpective diſtricts.

The ſalutary effects of this inſtitution are now no longer confined to the United Provinces——*The Boards of Health* at Venice, at Milan and Padua, have adopted it—The City of Hamburgh has done the ſame—The Empreſs of Ruſſia has countenanced it in her dominions—The Empreſs Queen of Hungary has given very particular encouragement to it—And in

France it is at this time under conſideration, by what means it may beſt be united with the general police of the kingdom.

It is a matter worthy of obſervation, that whatever diſcoveries had been made by the Faculty, of the method of recovering Drowned Perſons, prior to the year 1767, yet till that Period, hardly any other attempts appear to have been made, but ſuch as were ſuggeſted, at a time of confuſion and diſtreſs, by ignorant people who for the moſt part are greatly miſled by the unhappy prejudices prevailing in this matter.

The world has been undoubtedly much indebted to Dr. *Mead*, Dr. *Winſlow* and his Commentator Dr. *Bruhier*, Dr. *Fothergill*, Dr. *Haller*, Dr. *Lecat*, Dr. *Tiſſot*, Dr. *Van Engelen*, Dr. *Gummer*, and others, for very uſeful Obſervations and Eſſays upon this ſubject.

The ſeveral Caſes publiſhed and deſcribed in the Memoirs of the Dutch Society, ſufficiently prove the advantages ariſing from an obſervance of the Rules of that Inſtitution. It appears from thoſe Caſes, that perſons of all ages, from two years old to ſeventy-two, have been recovered, though apparently dead when brought on ſhore; that many perſons have been reſtored, who have been immerſed from fifteen minutes to an hour and a half; and in ſuch inſtances as nothing leſs than the moſt indiſputable teſtimony would render credible. It is found by experience, that relief may be given, not only in drowning, where it has been uſual to deſpair of it; but in other caſes, ſuch as Suffocation by Sulphurous Vapours*; in caſes of Strangling, Stifling, and in many apparent deaths by Cold, Hunger, and other cauſes.

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* By an order of the Queen of Hungary, perſons ſuffocated by Damps in her Mines, are treated in a particular manner, according to Inſtructions, and have been recovered.

From what has been already ſaid, it is much to be wiſhed, that ſome means may be found of giving the benefit of this valuable Inſtitution to Great Britain and its Colonies.

If the number of accidents is proportioned to the number of perſons employed on the water, this kingdom is more intereſted than any other nation, in the art of reſtoring drowned perſons. The large coal-mines in Great Britain, where numbers of men are yearly deſtroyed by the *damps*, which are ſo commonly fatal to the miners, and the frequent inſtances of perſons who come to an untimely end, by ſtrangling, and other caſualties, render the art of reſtoring ſuffocated and ſtrangled perſons to life, of great conſequence to the community.

The author of this account flatters himſelf that the ſubject of it is worthy of attention, and ſhall think himſelf happy if his deſign of promoting an Inſtitution in Great Britain, with ſome Improvement upon thoſe adopted in the neighbouring nations, in order to which he has already taken ſome ſteps, ſhall meet with general countenance and approbation.

The following Caſes are ſelected from the Society's Account of the Succeſs of its undertaking, and plainly demonſtrate the truth of the foregoing Remarks, and afford the moſt ſatisfactory evidence that all the Ends propoſed by the Inſtitution have been obtained, except indeed what appears by the Caſes themſelves, that the Society's Inſtructions have been too often neglected.

In all theſe Caſes the Premium offered by the Society has been obtained, previous to which proof muſt be made that the Patient had no ſign of life when brought on ſhore; and the utmoſt care is always taken to ſecure a true and faithful account of the circumſtances

circumſtances of each. Many of them appear to have been drawn up by illiterate perſons; therefore ſuch idle circumſtances as are nothing to the purpoſe are left out of this Tranſlation.

CASE I.

AT *Amſterdam*, on the 17th of September, 1767, an old Woman was taken out of the *Rakin*, a deep Canal, in which ſhe had lain ſunk a conſiderable time; and being ſuppoſed dead, was to be carried away to an Hoſpital for burial: but *Sybrand Yſerman*, a Skipper of Gouda, who had read the Society's Advertiſement, believing that Tobacco-ſmoke might recover her, made the trial with a lighted pipe he had in his mouth: he put it up her *anus*, and taking the bowl in his mouth, blew up the ſmoke of it, and of another pipe after it, which by degrees ſo far recovered her, that ſhe was able ſoon after to be carried home.

Old Woman
consid.ble time
in the Water
Tobacco ſmo

CASE II.

hild 2 years
ld. —
bacco smoke

AT *Groningen*, on the 29th of February, 1768, the daughter of *Henry Pieterſz*, a Child of about two years old, fell head foremoſt into a waſhing-tub, and remained ſome time in it undiſcovered. Its Father having found and taken it out, endeavoured to recover it by various means for the ſpace of half an hour, at the end of which time it gave ſome very faint ſigns of life, and then without any ſenſible motion in its pulſe, fell into a ſtrong Convulſion fit. But upon continuing the Injection of Tobacco-ſmoke into its inteſtines, and chaffing its temples with *Balſam Vitæ*, and holding the ſame to its noſe, it recovered ſurpriſingly, and in ſo ſhort a ſpace as two hours.

CASE III.

AT *Rotterdam*, on the 11th of February, 1768, the Wife of *Arnold Van Deyl*, a houſe-painter, got up unperceived and went out of the houſe in the night time, and three ſeveral times threw herſelf into a Canal. She was twice taken out before ſhe could ſink, and appearing ſenſible, was left to go home. She afterwards plunged herſelf a third time, ſunk, and remained three quarters of an hour under water. When ſhe was found again, ſhe was taken out, and treated by *Cornelius Maaſwinkel,* a Surgeon, who in the ſpace of an hour recovered her by various means, but principally by the injection of Tobacco-ſmoke, and then putting her in bed to her Huſband. This raſh action was committed in deſpair, becauſe the man her reputed huſband, by whom ſhe had two Children, obſtinately refuſed to marry her: after this diſaſter he owned himſelf in the wrong, and conſented to marry her; and this deſperate Attempt reſtored her to that

Woman
3/4 hour
under Wate
Tobacco Smok

that happineſs which other means had failed to obtain.

CASE IV.

ON the 25th day of May, 1768, about two Miles from *Leiden,* as the *Trekſchuit* from Delft was paſſing on, the halling-rope broke, and four paſſengers, then upon deck, fell overboard. Three of them were ſoon got out; but the fourth, named *Jan Spyker,* a Haberdaſher of Amſterdam, went to the bottom: he was, when found and brought on ſhore, to all appearance dead. Four Charity-Boys belonging to Amſterdam attempted to recover him, and brought him to life again by the means directed in the Society's Inſtructions.

CASE V.

AT *Amſterdam,* on the 10th of Auguſt, 1768, one *Lambert Tuebbes* from *Balk* in Friſeland, threw himſelf into the Town-ditch, in a fit of deſpair, and lay immerſed at leaſt twenty minutes. He was got out with difficulty, and in a great degree recoverd by *Frederic Pieterſon*, a Surgeon; but remaining weak, he was the next day carried to an Hoſpital, where, notwithſtanding *Dr. Hagen*'s care, and the attempts of others to ſave him, he died in the ſpace of two days, the diſtreſſing circumſtances he had long laboured under having too much weakened him.

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CASE VI.

AT *Fluſhing* in Zeeland, on the 14th of October, 1768, one *Jan Haſſel*, a Marine of twenty-three years of age, and a German by birth, being in liquor, fell from a high bridge into the water, and remained half an hour immerſed. When he was taken out, his eyes were cloſed, his mouth open, and his face blue: he was quite cold, motionleſs, without any feeling, without breath, or any

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in jugular vein
Tobacco fum
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any ſymptom of life. Half an hour more elapſed before he was got into a houſe and aſſiſtance given him. He was then laid before a great fire, rubbed with hot cloths dipped in Brandy; and in three quarters of an hour he diſcharged ſome froth at the mouth. In half an hour after that, about nine ounces of blood were taken from him, by bleeding at the jugular vein; ſoon after which he puked up ſome clear water. Volatile Spirits were then uſed, as was alſo the Tobacco Fumigator which could not ſooner be obtained, and the moment a ſufficient quantity of vapour was introduced into his bowels, he gave farther ſigns of life, and threw up ſome more water. A little brandy with a few drops of Spirit of *Sal Ammoniac* was then given him; the Spirit was held to his Noſe, and the rubbing was continued, upon which the blood began to circulate, and he was bled at the arm;

after which he ſpoke, and deſired to be allowed to ſleep, which being complied with, he ſlept all night, and was well enough next day, to continue his journey, being only a little feveriſh, with a complaint of ſoreneſs all over his body. The whole of this treatment was directed by *Joſeph Raymondon*, a ſurgeon to a Dutch ſhip of war.

CASE VII.

NEAR *Harlingen* in Friſeland, on the 18th of October, 1768, the Child of *Hendrik Beerendſz*, a Girl of four years old, fell into a ditch headlong, and ſtuck in the mud; and having none but young children with her, who ran away frightened, no alarm or aſſiſtance was immediately given; but ſhe was ſome time afterwards taken out by a perſon coming along the road, who diſcovered her, and thought her quite dead. As he brought her into town, he met with a Surgeon, one *Jan*

Schoonebeek,

downwards *Schoonebeek,* who directly turned her head downwards, and kept ſhaking her as ſhe was carried home: there he continued the ſame motion by other hands for more than half an hour—when ſhe gave ſome ſigns of life, threw up a little ſlime, and began a crying, after which ſhe was put into a warm bed, and perfectly recovered.

CASE VIII.

AT *Weſter-en Hilliger Lee* in the Province of *Groningen,* on the 6th of September, 1768, the Son of the Reverend Mr. *Conradus Woldringh,* a Child aged two years and five months, running after a dog, ſlipt through a hedge into a large ditch, and after being ſought for more than fifteen minutes, was brought home quite lifeleſs. Its father, called down from his ſtudy, examined it attentively, and concluded it dead. Yet greatly anxious for its recovery if poſſible, he ordered a large fire to be made, and the Child to be ſtripped,

ſtripped. He then took it upon his knees, wrapping it up in his own warm night-gown, held it in an inclined manner, with its feet higher than its head, and with his hands and knees kept its body in conſtant agitation. It was after that well rubbed, and warmed before the fire, then fiercely burning, and in the ſpace of ten minutes it gave ſome faint ſigns of life, uttering that little ſound frequently heard at the moment of children's birth, and it bled a little at the noſe.

The rubbing and agitation being now continued upon a cuſhion, it began to groan, and to breath with great difficulty —but it ſtill farther recovered with the perſeverance of this treatment: its night-clothes were put on, and it was laid in a warm cradle by the fire ſide. More than half an hour elapſed before it regained heat in all parts of its body; but as ſoon as that was obtained, it broke out in a profuſe ſweat, and the recovery was completed.

CASE IX.

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WITHIN two miles of *Rotterdam*, on the 9th of November, 1768, one *Hendrik Stroiberg*, a labouring man, in liquor, was drowned in the river *Rotte*; he was laid upon a lighter near the place where he was taken up, after an immerſion of thirty minutes and more. Some farther time elapſed before Dr. *John Evans*, who directed this cure, could find a proper place of treatment for him: he was then ſtripped, his joints were become ſo ſtiff, as to render the ſtripping him difficult. He was put into a warm bed, rubbed, and properly treated: ſome pulſation was found in his arms, when a Surgeon attempted to bleed him, but with little effect. Some Tobacco-ſmoke was blown up his inteſtines, and contributed to his recovery. At the end of an hour and a half, he complained of a difficulty in breathing, and an oppreſſion at his heart, for which an emetic was given him, that operated downwards inſtead of upwards. The next day he had a ſharp pain at his breaſt, which was ſcarce bearable when he breathed: a ſecond bleeding and ſome medicines removed that pain to his right ſide, where it ſettled, yet leſſened by degrees, as he recovered.

CASE X.

AT *Amſterdam*, on the 30th of November, 1768, one *Lambert Ploos*, an old man, fell from a boat he was puſhing forward under a bridge, and ſinking to the bottom of the canal, was not readily found, becauſe it was dark: being got out at laſt, he was put into a barge, and rolled on a caſk, though he was cold and ſtiff— ſome brandy was poured into his mouth, and he was carried to a public-houſe, where he was laid before a large fire, ſtripped, and rubbed, and had ſome dry clothes put on. When he ſhewed ſome ſigns of life, a meſs of beer and bread, with mace and ſome brandy in it, was given him by degrees as he recovered; which was ſo faſt, that in about ſix hours from the firſt of the accident, he could be conveyed to a boat that was to carry him home to *s'Graveland*, where he was perfectly reſtored to health.

CASE XI.

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bed with brandy
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rs restored

AT *Rotterdam*, on the 30th of November, 1768, a man called *Jan Joſephus van Eel*, being in liquor, fell into the river *Maeſe*, in the dark, and was got out as ſoon as he could be found. Some of the byſtanders rolled him upon a caſk, and would have made an end of him ſoon, had not Dr. *Evans* reſcued him out of their hands. His neck was then rubbed with brandy, of which ſome part was poured into his noſe; and ſome of it getting into his mouth, he opened his eyes and endeavoured to ſwallow it. Being got home, he was undreſſed, put to bed, rubbed, and attempted to be blooded, which however he would not ſuffer to be done. Some time after, he voided blood up and down from the bruiſes of his being rolled, and in a few hours afterwards he expired.

The common error of this rough treatment is ſtill farther exemplified by the caſe of a young man, drowned in the ſ ne river, who muſt inſtantly have been killed by the blind zeal of the byſtanders, had not an Apothecary, called *Bezoet*, forcibly taken him out of their hands.

CASE XII.

AT *Alkmaar* in Holland, on the 19th of January, 1769, one *Lodewick Schoening*, a Maltſter belonging to a Brewhouſe, the Starry Crown, ran into a canal in purſuit of his hat, and ſhot forward ſo far, as not to be found in leſs than fifteen minutes; and when he was got out, he ſeemed ſo very lifeleſs and ſtiff as to be out of the reach of art. However to leave no means unattempted, he was firſt rolled over a caſk, then carried to a brewhouſe, laid before a great fire, and undreſſed; and ſeeming to give ſome ſigns of life, a glaſs of Jeneva was poured into his mouth, which farther recovered him and made him throw up ſome water. Another glaſs of it, which he aſked for, ſet him up ſo far, that, though much ſwollen, he was able to be carried home, where he recovered gradually.

CASE XIII.

AT *Leuwarden* in Friſeland, on the 26th of January, 1769, the Child of *Hendrik Hendriks Gardeniers*, a boy of three years and ſix months old, fell under the ice, and remained there for half an hour before he could be found: when he was taken out, he was dead to all appearance; but a humane woman, named

Ida Schapeling, took him into her houſe, ſtripped him directly, wrapped him up in a woolen apron, warmed and rubbed him before a fire, and chaffed his head with warm brandy. After forty minutes treatment, putting her finger into his mouth, ſhe found he bit it, and then ſhe poured in a ſpoonfull of brandy. After this ſhe put the child into a warm bed, with a ſtone jug of hot water at its feet; and by ſuch means made it ſo much better, that in the ſpace of an hour from its firſt being brought into her houſe, its parents could ſafely carry it away wrapped up in a blanket; and ſhe had the pleaſure to ſee it come to thank her the next day.

The Magiſtrates of *Leuwarden* had this Caſe publiſhed in their town newspaper, with all its circumſtances.

CASE XIV.

AT *Amſterdam*, on the 25th of February, 1769, a maid ſervant, drawing water in the morning, fell into the canal before her maſter's door, and after ſome ſtruggling ſunk to the bottom. She was got out, in about a quarter of an hour, and had not the leaſt ſign of life in her. Air and Tobacco-vapour were immediately blown up her inteſtines: ſhe was ſtripped, laid before a fire, and was rubbed with cloths dipped in brandy, till ſome ſigns of life were diſcovered, when alſo ſome froth appeared upon her mouth. An aſſiſting Surgeon's apprentice tried to bleed her, but got no more than a few drops: not being ſatisfied with this, he opened the jugular vein, and took away eight or nine ounces of blood. As ſhe recovered, fourteen or fifteen drops of Spirit of *Sal Ammoniac* were given her in water. Some hours afterwards ſhe was put to bed, was rubbed, and had a Tobacco-clyſter. She was alſo bled in her right arm, and at length came entirely to herſelf; yet complained of an oppreſſion in her breaſt.

bacco Vapor

At noon ſhe was ordered to be blooded a third time. At four in the afternoon, little complaint remained, but a ſtraitneſs over her breaſt, which ſhe had before been ſubject to, and was afterwards cured.

CASE XV.

AT *Rotterdam*, on the 8th of April, 1769, the daughter of *Meindert den Broeder*, a girl of ten years of age, fell into a ſtagnated deep muddy ditch, near the rampart of the town, and ſtuck in it for ſome time. When ſhe was taken out of it, ſhe ſeemed, according to the account of the Surgeon *Hooykaas* who directed the following treatment, to be abſolutely dead, and looked as black as if ſhe had been hanged, having alſo a quantity of froth at her lips and noſe. She was immediately ſtripped, put between warm blankets, and rubbed. After the introduction of ſome Tobacco-vapour into the inteſtines, a bleeding was attempted, and only about four ounces of blood obtained, by drops; the jugular vein not being practicable, upon account of the great ſwelling of the neck and head. Three perſons then continued to rub, and inject ſmoke, for the ſpace of an hour, when a faint yawning, like that of a departing patient, gave the firſt ſmall ſign of life. Some Spirit of *Sal Ammoniac*, held to the noſe, produced no effect; but in an hour and a half, ſome ſlight pulſation was diſcovered; ſoon after which, ſhe diſcharged upwards and downwards, and then began to move her legs and arms. At the end of two hours, ſhe began to ſcream, and cried out, *I am fallen into the water*; and afterwards complained of ſoreneſs all over her body. Some cordial was at this time given her, which had before been fruitleſsly attempted, and now ſerved greatly to recover her. About an hour and a half afterwards, ſhe complained of a great pain in her bowels, and

bacco ſmoke

a difficulty in breathing, for which a clyſter with an infuſion of Tobacco was adminiſtered, and it operated in ſo copious a manner, as to give her great relief. An hour and a half after this, ſhe was delirious, and ſtill more oppreſſed—it was again tried to bleed her, and ſtill without ſucceſs; but a bliſter was applied to her back, and thought to do her good. A laxative medicine was given her by degrees during the night, and had its intended effect. Next morning ſhe had a violent pain in her ſide, and a conſiderable oppreſſion, for which recourſe was had to bleeding, which at laſt ſucceeded on her hand, and immediately relieved her. The next day ſhe voided ſome hard, black, clayey ſtuff: the day after that, ſhe complained of a pain in her breaſt, which was found to proceed from ſome ſkin being rubbed off during the operation. Her tongue remained furred for ſome days, but was at laſt cleared by a repetition of the laxative medicine; and ſhe then gradually recovered her former ſtrength, to the great comfort and aſſiſtance of an old helpleſs father, whom this girl took care of, whilſt the mother was abſent, indefatigably working as a chairwoman for the ſubſiſtance of her family.

CASE XVI.

AT *Amſterdam*, on the 9th of April, 1769, it happened at nine o'clock at night, that *Beetje Harmets*, a widow woman of ſixty-two years of age, fell into the *Keiſersgragt*, and remained immerſed a quarter of an hour. As ſoon as ſhe was got out, two Surgeon's apprentices, *C. de Beer*, and *J. A. Beverly*, had her ſtripped before a fire, bled her, rubbed her hard, eſpecially along the ſpine of the back, with cloths dipped in brandy, and blew ſome Tobacco-ſmoke into her mouth, which made her throw up ſome water, and then ſhe gave ſome ſigns of life;

Tobacco ſmoke
the mouth.

life; but ſoon after ſhe was taken with ſtrong convulſion fits, nearly baffling all hopes of farther recovery; yet by perſeverance, and reducing a rupture ſhe was found to have, ſhe grew ſo much better, as to be able, in three hours time from her immerſion, to be conveyed home in a carriage.

CASE XVII.

AT *Amſterdam*, on the 17th of April, 1769, *Anna Woertman*, a woman of twenty-ſeven years of age, belonging to that pleaſant part of the city called the *Plantage*, was taken out of the water, without its being known how long ſhe had lain in it. She was inconſiderately rolled upon a float, for a quarter of an hour, and is ſaid to have voided a good deal of water. She was then carried into a houſe, where *Bernardus Donſelaar*, an apothecary, was ſent for, and told ſhe had juſt before given ſome very faint ſign of life; though in fact ſhe appeared quite lifeleſs, was ſtiff, and had green and blue ſpots all over her body.—She was laid before a fire in blankets, and rubbed with a mixture of ſpirit of *Sal Ammoniac* and Eſſence of Roſemary, along the back bone, the loins, the neck, the head and temples, and a ſtone jug with hot water was laid at her feet. Some farther ſigns of life then appearing, ſhe began to ſhake as in the cold fit of an ague, ſpake and complained; upon which ſome ſpoonfuls of Jeneva were given her, and ſhe was blooded—her blood was black and thick, not inflamed. Being thirſty, ſome milk and water was given her; and then ſhe fell into fits ſeemingly ſtrong enough to carry her off: theſe however were removed by a cordial adminiſtered to her. In the ſpace of four hours and a half ſhe was ſo much better, as to be carried home, and put to bed to her ſiſter, where ſhe fell into a breathing ſweat. About five hours afterwards ſhe complained of a great oppreſſion, and a violent pain in all her limbs; for which an aperient laxative mixture was given, and which made her part with a quantity of watery matter. The pain augmenting, and fixing in her ſide and breaſt, ſhe was twice bled, and her blood being then found much inflamed, it was wiſhed to repeat the bleedings; but ſhe proved to be too weak: however, a bliſter was applied to her ſide; and other treatment being opportunely given, ſhe was entirely recovered in the ſpace of a fortnight, the ſlowneſs of which is attributed to her having been afflicted ſix months before with a fever, and conſtant depreſſion of ſpirits, upon account of bad circumſtances.

CASE XVIII.

AT *Amſterdam*, on the 26th day of May, 1769, at midnight, a young woman, *Racheltje Ooms*, taken out of the *Damrak*, where ſhe was found drowned, was firſt rolled upon a caſk, and then carried into a houſe, attempted to be bled by *Barend Boerregter*, a Surgeon, then rubbed and chafed with Spirit of *Sal Ammoniac*, had brandy ſpouted into her mouth, and her noſe tickled with a feather—but all this being done without effect, ſhe was laid before a fire, the rubbing was continued, ſome more brandy put into her mouth, and after three quarters of an hour, ſome pulſation being felt in her left arm, a bleeding was performed there, and more than twelve ounces of blood taken away; after which ſhe gave ſuch ſigns of life, as made all farther treatment appear ſuperfluous; and ſhe was able to walk home at the end of five hours from the time of her being firſt found.

CASE XIX.

AT *Amſterdam*, on the 29th of July, 1769, a Boy of fourteen years of age, called *Jacob Voorn*, rowing with ſome others in a boat, fell overboard, and ſunk directly. More than twenty minutes elapſed before he could be got out of the water. He was then carried into a houſe, where by the direction of *Floris Loosjes*, an apothecary, he was ſtripped of his clothes, laid in a blanket, and rubbed all over; Tobacco-ſmoke was blown up into his inteſtines, and wind forced into his mouth, whilſt his noſe was held cloſe, and this repeatedly. He was bled at the arm, and nine or ten ounces of blood were taken away; after which, upon the appearance of ſome ſigns of life, a little brandy was put into his mouth; and the room in which he was thus treated, being thought too cloſe, he was carried into a more airy room, where ſome more brandy being forcibly ſpouted into his throat, he rouſed at once, and ſcreamed out; when he became quieter, ſome milk and water was given him to drink. He was then put to bed, had hot cloths applied to him, and was well covered up. He grew warm

by

by degrees, excepting at the ſoles of his feet, and was delirious at times; but that ceaſing, he complained of a pain and inflammation in his throat, which, by the preſcription of a Phyſician, was got the better of in a few days, and the lad totally reſtored.

CASE XX.

AT *Rotterdam*, on the 1ſt of Auguſt, 1769, at the dock, in the *Herring-ſleet*, one *Gerrit Schrauwen*, the ſkipper of a yacht belonging to Mr. *Hogendyk*, in changing the ſituation of the ſhed in which ſuch pleaſure-boats are kept, ſlipped his hold, fell into the water, and ſunk directly in a part where the depth was not leſs than twenty five feet. A peaſant firſt obſerved this ſhed floating by itſelf, then diſcovered a hat near it, and concluding ſome miſchance had happened, gave the alarm; upon which ſeveral men came with boat-hooks, which proved too ſhort, and ſome time elapſed before they could get others, none longer being at hand. He was at laſt got out by a friend of his, one *Arnoldus Fynands*, who found him at the diſtance of fifty paces from the float from which he fell; and it appeared that he had endeavoured, as long as his ſenſes laſted, to get towards the quay. When he was taken out of the water, his eyes were cloſe ſhut; his face was diſtorted, and looked wan; and his jaw was ſo much fixed, that with difficulty his mouth was broke open, and brandy was poured into it twice without any ſucceſs: more than twenty-five minutes were now elapſed ſince he firſt fell in; yet his friend, with three other workmen of the dock-yard, attempted to recover him; they ſhook him violently, they by turns rubbed his breaſt and belly, ſqueezed his throat, and forced ſome water and blood out of it. They then carried him to the houſe of one *Schaardenberg*, a Surgeon, dwelling

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at ſome diſtance from the dock, there ſtripped him of his wet clothes, and put on others dry and warm of the byſtanders. They then had recourſe to the uſual treatment, and could not in leſs than twenty minutes obtain any ſigns of life, which they did at laſt, when the Surgeon put into his mouth ſome ſpiritous liquor, to which the patient had always an averſion. He than began to ſcream, called for his companion, looked aghaſt, and recovered by degrees. When he was ſufficiently better, they led him home ſtaggering, and throwing up more water and blood. During two or three days, he looked gloomy, and was low-ſpirited; but ſoon after, eſpecially by means of a trip taken with his maſter, he recovered entirely.

CASE XXI.

AT *Ooſtzaandam* in North-Holland, on the eighth of Auguſt, 1769, a Child of three years old, the Son of *Albert Maſker*, a Taylor, was taken out of the water, after an immerſion of fifteen minutes, and brought home to its parents. A Surgeon, *J. Van Macheren*, by whoſe door it was carried, followed it, and took care of it. He found the child entirely motionleſs, its limbs ſupple, its head and face blue, and a quantity of bloody froth upon its mouth and noſe. He ſtripped off its wet clothes as faſt as poſſible, and put it to bed between blankets, with a jug of hot water at its feet. He then applied the Tobacco-vapour pipe, and rubbed its back bone with fine ſalt and warm brandy. He opened its mouth by force, to pour in ſome brandy and butter, which ran out again directly: he held the Spirit of Ammoniac Salt to its noſe, blew ſnuff into it, and tickled it with a feather. Soon after this, he perceived ſome pulſation in a large artery, which encouraged him to continue his treatment, 'till he heard a rattling in its throat, and a rumbling in the

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the belly. Then it began to ſweat, and to reach a little, and had a diſcharge; which ſymptoms did not appear till after the ſpace of three hours, at the end of which it was in a fair way of recovery. After having ſome reſt, it was feveriſh and drowſy; as much beer and butter, and weak tea, as could be got down, being given to it, the amendment was perceptible. An oppreſſion remaining, ſome four dough was put to its feet, and it became well and chearful again the next day.

CASE XXII.

IN *Amſterdam*, on the 23d of Auguſt, 1769, *Samuel Abrahams*, a Jew, who got his livelihood by carrying greens about for ſale, fell from a fiſh-float into the water, ſunk, and was got out again by two other Jews. Some time after, *Frans Nicolas Wickel*, a Surgeon, came to their aſſiſtance, got him carried into a public houſe, had him ſtripped, laid before a fire, and rubbed all over the body with brandy, and took twelve ounces of blood from him: after which, to continue the treatment without interruption, he got the aſſiſtance of *Jacob de Koningh*, another Surgeon's apprentice, and they together continued rubbing, held Spirit of Sal Ammoniac to his noſe, gave him two Clyſters of an infuſion of Tobacco, with ſome ſalt and oil, which produced a copious evacuation: they poured ſome *Liquor Anodinus* into his mouth; he then puked, and came to himſelf ſo ſpeedily that in one half-hour's time he aſked for ſome drink. Some milk and water was then given him, a dry ſhirt was put on, and he was laid between blankets in bed, becauſe he complained of an oppreſſion upon his breaſt; and half an hour afterwards, ſitting up in bed, he ſeemed taken with a convulſion fit, fell back and expired. This ſudden death was by ſome attributed to the falling ſickneſs, to which he was ſaid to have been ſubject.

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CASE XXIII.

AT *Amſterdam,* on the 23d of Auguſt, 1769, the Son of *Arent vanden Bergh,* a Boatman, being a child of ſomewhat leſs than two years old, fell into a rain-water ciſtern with a very narrow mouth, into which its mother would have ſlid after it without any proſpect of aſſiſtance, had ſhe not been prevented by ſome byſtanders, who themſelves did what they could to get at the child, but were obliged to have recourſe to a lad, who being thin could ſlip down, and being held, grope for the child below him. He did ſo with good ſucceſs, and got the child, which was then (poor helpleſs thing) laid upon a caſk, rolled and otherwiſe tormented, to bring it to itſelf again. One of the aſſiſtants had the preſence of mind to uſe a Tobacco-pipe, to blow its ſmoke up the child's inteſtines; upon which ſome ſigns of life being diſcovered, it was laid upon its mother's lap, juſt

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juſt when Dr. *Bernard*, who had been ſent for, came in, and directed the following treatment, of which he himſelf has given the account. He ordered a good fire to be made, got the mother to ſtrip the child, and made enquiry about what had been done prior to his coming.—He then had it diligently rubbed all over with Jeneva and Salt, 'till it uttered a plaintive ſound, and ſome froth appearing at its mouth and noſe, it began to puke.—It now hung its head over its ſhoulders, ſeemingly diſtreſſed, then threw up ſome more phlegm, and had a diſcharge.—The uneaſy motion of the head continued, without the leaſt pulſation in any of the blood-veſſels, 'till at laſt, with a third fit of puking, ſome beating was felt in the left arm.—Then the motion of the head leſſened, the child ſeemed leſs oppreſſed, and began to cry. The mother was then aſked what it liked to drink; and that proving to be beer, a little of it was warmed with ſome ſugar, and was drank off with eagerneſs.—It ſeemed as yet not rightly recovered, for want of a more copious diſcharge, for which a mixture was ordered to be given by a ſpoonful every hour, the child being kept as warm as poſſible in blankets, the pungent vapour of the Tobacco was not thought farther eligible:—it was alſo judged that a bleeding was not adviſable, neither of the jugulars being turgid, nor any blood veſſels diſcoverable in its arms, or on its hands. In the evening it lay quiet, looked about diſtinctly, and, as the mother thought, grew better viſibly; its hands felt naturally warm, its pulſe was regular, but quick as uſual with children of that age.—The mixture having had no effect, it was repeated, and the mother charged to keep the child very warm, as it was imagined it muſt ſweat much in the night, with the great quantity of water it had ſwallowed; and to forward this, ſhe was directed to lay a jug with hot water at its feet; all which ſhe exactly complied with. It did ſweat conſiderably in the night, and ſtarted often in its ſleep, 'till about midnight, when it began to reſt quietly :—early in the morning it had two ſtools, after which it aſked to ſtay up and be dreſſed ; which being granted, it took its breakfaſt as uſual, played about a while, and then lay down to ſleep again. It recovered perfectly, though Dr. *Bernard* ſays it was of an uncommonly weak frame, and much inclined to the rickets.

CASE XXIV.

AT *Zuiderdrachten*, in the province of Friſeland, on the 3d of June, 1769, a Boy of three years old, the Child of *Cornelis Gedſers*, a Wool-dreſſer, fell into a ditch, out of which he was taken as dead. He was treated by a Surgeon, who in the ſpace of fifteen minutes obtained ſome faint ſigns of life, but could not in leſs than nine hours get him ſo far recovered as to ſpeak. He tried every method, recommended or not, except bleeding. He ſhook the child for a conſiderable time with its head downwards :—he blew air into its inteſtines, firſt with a Tobacco-pipe, and afterwards with a Syringe :—he opened its mouth by force, and blew air into its throat :—he dried its body, chafed it, and rubbed it with brandy and ſalt along the back bone.—He held a volatile ſalt to its noſe ; tickled it with a feather ; rubbed the ſoles of its feet with a bruſh, and gave it two clyſters; after all which applications, his endeavours were attended with the deſired effect.

CASE XXV.

IN the City of *Dordregt* in Holland, in the month of July, 1769, it happened that a boy of ſix years old, at play on a wharf, fell from a beam into the water, unnoticed by his playfellows, who, when they miſſed him, ran up to the road to ſeek for him : but a younger child, not yet fit to play with the others, and who at ſome little diſtance had ſeen him fall in, and ſtood ſtaring for a time as ſtruck with amazement, ran home to tell of this accident; and at that very moment met its father, who was juſt returned from the Province of *Zealand*. This unexpected circumſtance diverted the child from its purpoſe for a while; but as ſoon as a moment's quiet ſucceeded to the great expreſſions of joy in the family, the little child took the opportunity to make them underſtand, by broken words and ſigns, that ſomebody was fallen into the water, and led them to the place where it happened; upon which, immediate ſearch being made, the boy was found, and taken out, dead to all appearance, after having remained for ſo conſiderable a time under water. He was carried home, was undreſſed, had ſome tobacco-ſmoke blown up his inteſtines, and was put into warm blankets, in which he gave ſome faint ſigns of life, crying when the ſoles of his feet were tickled, but without any other certain ſymptom. After many more trials, his mother took him into bed to her, and by rubbing and cheering him all night, got him to a ſtate of perfect recovery. The ſteady perſeverance in this treatment is remarkable by its being carried on for a ſpace of time not leſs than twelve hours, and gives room to the Surgeon, *Jan Van Heſpel*, who relates the caſe, to utter this exclamation: —"Who knows in how many thouſand "perſons the remaining ſpark of life is "extinguiſhed by injudicious practices! "when ſpeedy and proper endeavours "might reſtore a ſufficient degree of "genial heat."

CASE XXVI.

AT *Leuwarden* in Friſeland, on the 3d of September, 1769, a Boy of four years and five months old, the Son of *Cornelis van Meningen*, a Tanner, fell into the water, and ſlid forward from the place at which he went in, which was pointed out by a ſtill younger child who had ſeen the accident from the other ſide of the canal. After more than half an hour's ſearch by ſeveral perſons, he was taken out by his own father, who immediately ran about with him in conſtant agitation, and had wind repeatedly blown up into his inteſtines by the aſſiſtants: as ſoon as the child was brought home, it was ſtripped, the blowing was continued, and it was rubbed before the fire 'till it gave ſome faint ſigns of life, ſoon after which it threw up ſome clear water, and voided ſome thin excrement: it was then thought proper to give it a little freſh butter melted with brandy, to make it reach, which it did repeatedly, and its ſpeech returned, at which time it was put to bed well wrapped up; and thus by degrees it recovered, ſo as to be able in the courſe of three days to go to ſchool again.

CASE XXVII.

At *Amſterdam*, on the 8th of September, 1769, *Hanna Polak*, a German Jeweſs, drawing up a pail of water, ſlipped from the plank upon which ſhe ſtood, fell into the canal, and receiving a blow of the pail upon her head, was ſtunned, and ſunk at once. She was got out in eight or ten minutes time, and attended by *Michiel Cramer*, an Apothecary, and *Iſaac Serrano*, a Surgeon, the latter of which bled her upon the ſpot where ſhe was firſt laid down: they then got her carried into a houſe, where they blew wind into her lungs and inteſtines; gave her a clyſter, and rubbed her back bone with Spirit of Sal Ammoniac: having no bed, they ſet her in blankets on a chair near to a German ſtove. Three hours elapſed before one ſingle ſtroke of a pulſe was felt in her,—and that ſymptom giving freſh vigour to the operators, the rubbing was continued;

a ſtimulating clyſter was given her, ſhe was kept as warm as poſſible, and began to perſpire. Two hours and a half after that, ſhe began to ſpeak, took ſome liquid, and threw up ſome water. She fell then into convulſive fits, which by ſome medicines were allayed. At the end of ſix hours more, ſhe was bled again at the foot, which compoſed her greatly, and from thence forward ſhe gradually recovered.

CASE XXVIII.

AT *Horn* in North-holland, on the 15th September, 1769, two Boys driving a waggon into town, and delivering ſome bags of meal at the ſlope of the *Ruſbrug*, a bridge near the north gate of the town, it happened that the horſe took fright, flew acroſs the road, and threw the waggon upſide-down into the ditch, wherewith a Boy who ſat in the middle of it was covered, the other who was in the fore part of it having jumped off. The

Boy who fell under, by name *Cornelis Smit*, was ſixteen years old. Five men of the town ran to his aſſiſtance, but knew not on what ſide of the waggon to get at him; after ſome time they eſpied one of his legs ſticking out a little from under it, and in vain endeavoured to pull him out: the Boy lay upon his back, deeply depreſſed in the mud by the weight of the waggon, beſide which the horſe was alſo in the way:—they then cut his traces; as ſoon as he found himſelf leſs confined, he began to rear and ſtruggle, and was near trampling the Boy's leg to pieces; they held and ſtroked him, 'till he was quite looſe, and then led him out; after which lifting up the waggon, they dragged out the Boy, and laid him upon the bank, covered and disfigured with mud, and as they thought dead beyond doubt. It was incumbent upon them however to try to find out whether any life ſtill remained in him, and to recover him if poſſible. They firſt waſhed the mud off his head, face and neck, which they found to be black and blue; they cut the collar of his ſhirt, and then poured ſome brandy into his mouth, by the effect of which upon the muſcles of his face, they diſcovered ſome motion in him, which was ſurpriſing after his having been more than a quarter of an hour in the above deplorable ſituation. They laid him upon a caſk, and rolled him ſlowly about, in expectation of ſome farther ſigns of life, which indeed returned but faintly: upon thoſe indications they put into his mouth ſome buttered beer with brandy, and rolled and ſhaked him again; after which he began to throw up ſome froth, water and blood. He then was carried to a neighbouring public-houſe, where he was with difficulty ſtripped of his clothes, waſhed all over with warm water, and wiped with hot cloths, which ſeemed to reſtore life to him, for he cried out with it. Some dry woolen things were then put on him; he was ſet in a great chair before a good fire; and ſomething emetic was twice given him with ſo much effect, that he vomited up, as is ſaid, even clods of mud. Thus cleared, he was put into a warm bed, where at firſt he was feveriſh, but afterwards reſted well; and next day, to the ſurpriſe of all, was quite recovered, and had not one ſingle part of his body hurt.

CASE XXIX.

AT *Amſterdam*, on the 7th of September, 1769, a Child of one *Nicolas Vermeulen* playing upon a bridge fell thro' the rails into the water. The mother then big with child, ſaw the accident out of her window, flew down ſtairs, ran to the bridge, jumped down to ſave it, and was in great danger of drowning. The father, who at that moment got home, finding out what was the matter, made haſte to the quay, and with ſome aſſiſtance got out his wife firſt, and afterwards, in a quarter of an hour's time, the child was found, and brought on ſhore, to all appearance dead. Several attempts to recover it were in vain made, both on the quay and in the houſe; at length one *Chriſtoffel Roodolphs*, a Surgeon, came to their aſſiſtance: he had the child ſtripped directly, wrapped in warm blankets, and laid before a fire. He then took ſome brandy in his mouth, forced open that of the child, and ſpouted it in: he blew his breath ſtrongly into its mouth, and in about twelve minutes time ſome ſigns of life appeared, ſuch as a faint reſpiration, a ſighing, a grinding of the teeth, and ſome convulſive motion, the ordinary progreſſive ſymptoms of recovery. He continued his treatment for an hour and a half longer, and bled the child, after which it ſeemed quiet for a while, yet was a good deal oppreſſed in its breathing. The next day it was relieved by a ſecond bleeding, after which it recovered by degrees to perfect health.

CASE XXX.

AT *Leyden*, on the 4th of February, 1769, as *Jacobus Clavan*, a Tanner's journey-man, twenty three years of age, was ſtepping into a boat to help his ſuperannuated father to row, he miſſed his ſtep, fell into the water, went down, and coming up again, he cried out, *I am loſt!* then ſunk, and remained at the bottom. His poor father could do no more than feebly to call for help. A quarter of an hour elapſed before he was got out of the water, and on ſhore. No ſigns of life appeared: a good deal more time was loſt before it was agreed upon to carry him into a houſe, and ere he was received into one: and in this way half an hour paſſed from his firſt falling into the water, before any treatment was attempted, when Dr. *Jac. Smazen* gave him his aſſiſtance by ordering him to be ſtripped before a good fire, covered with blankets, and rubbed all over:

this was followed with opening a vein in each arm, the orifice in the firſt having yielded but a few drops of blood; but the other flowing freely, ſome ſmall motion was perceived in the body; a little brandy was then poured into his mouth, and he was chafed with ſome more. With this aſſiſtance, and the loſs of twelve ounces of blood, he became ſenſible, threw up ſome phlegm, ſeemed violently oppreſſed, and complained of a great pain in his head and breaſt. He was then put into a warm bed, a cordial was given him, and afterwards a meſs of buttered beer and bread, with which, and ſome reſt, he became ſo much better, that he was carried home in leſs than nine hours from the beginning of the accident. He did not however recover very faſt, for it was more than three days before he acquired his uſual ſtrength.

CASE XXXI.

AT *Amſterdam*, on the 17th of November, 1769, it happened, that as *Antony Witneven*, a porter, was leaning againſt ſome baſkets by the water-ſide, probably ſomewhat in liquor, they gave way, and he fell into the Canal. When he was got out by ſome of his fellow porters, they pronounced him dead:—they nevertheleſs carried him to a beer cellar, ſet him upon his head, ſhook him, and gave him ſome farther rough and very improper uſage:—notwithſtanding which, by ſome warmth and rubbing, he gave ſigns of life, and recovered in ſome degree, but in two days time he died.

This, and other inſtances, help to ſhew that a recovery is found more difficult, where the patient has been much addicted to liquor, and where the firſt treatment has been preceded by rough uſage.

CASE XXXII.

IN the ſuburbs of *Groningen*, on the 19th of November, 1769, the ſon of *Caſper Boſchman*, a boy of nine years old, waſhing his hands at a hole cut in the ice, fell in, and ſlid forward about eight feet under it. As ſoon as a younger brother of his had given the alarm by his running to fetch a pole, the boy was ſought for with it; and his father returning from church, informed of the accident, ran to the place, got into the hole, broke the ice with his hands, breaſt, and ſhoulders, notwithſtanding its being two inches thick, and having found his child at laſt, ran home with it upon his arms, ſhaking it as he went, though to all appearance dead. He ſtill ran about with it for a time, in the ſame manner, at home, whilſt a fire was lighting, and then made two women ſit down with it before the fire, to rub it all over with warm cloths, eſpecially along the back bone, and to ſlap the ſoles of its feet with their hands. Soon after this treatment the child ſeemed to breathe a little; and then it was put to bed, with a ſtone bottle of hot water at its breaſt and hands, and heated bricks were put to its back and feet. As the child recovered, the father made it take ſome brandy with melted butter, which made it puke up ſome water and blood; but by repeating the doſe ſome of it ſtayed upon its ſtomach: ſoon after it appeared delirious by intervals, which however went off; and it recovered gradually during the courſe of ſeveral days, at the end of which its ſtrength returned entirely.

CASE XXXIII.

In the large Canal, near the Town of *Ouderkerk*, the *Trekſchuit* going from *Gouda* to *Amſterdam*, in the night, it happened on the 22d of December, 1769, that one *Jan Valk*, a bulky man, advanced in years, a paſſenger, fell over-board, ſunk and remained a quarter of an hour under water, before the boat could be ſtopped, turned, and he be got out. As ſoon as he was taken into the *ſchuit*, a ſhopkeeper from *Rotterdam*, *Pieter Knuijſting*, the perſon who was ſeated by him before he fell in, took charge of him, laid him on cuſhions upon the middle bench, and deſired ſuch of the paſſengers as ſmoked Tobacco, to fill and light their pipes; of which he made ſuch good uſe, that after blowing up the vapour of ſeven pipes into the inteſtines of the patient, he gave ſome ſigns of life, and brought up a few mouthfuls of water. After uſing ſeven more pipes, and being ſupplied with the handkerchiefs of the paſſengers, warmed by means of the ſtoves generally uſed in the *Trekſchuits*, he rubbed the patient's breaſt and belly with them for above half an hour, and by the time they arrived at the town, he began to ſit up, and ſoon after was led into a tavern, where being undreſſed, he was put to bed in warm blankets; but not gathering warmth, and having complained of exceſſive cold, a ſtone bottle with hot water was laid to his feet, and therewith at the end of two hours treatment he was much recovered: but as ſoon as the town gates were opened, and a ſurgeon could be got, he was let blood, and he recovered ſo well as to be able to return home in the evening of the ſame day in another *ſchuit*.

CASE XXXIV.

AT *Rotterdam*, on the 31ſt of January, 1770, the ſtreets being ſlippery, it happened that *Johanna Onkruid*, a Woman of about fifty-four years of age, drawing water out of the Canal before her door, fell into the water, and ſlipped under the ice without being obſerved, and there being a lock near to the place, ſhe was ſlowly conveyed towards it by the current of the water: ſhe was afterwards diſcovered by another woman alſo drawing water, who gave the alarm, and had her taken out as ſoon as poſſible. She was carried home, and *Hendrick van Schaardenburgh*, a Surgeon, took charge of her. He firſt poured ſome brandy into her mouth, had her ſtripped, had ſome aired things put on her, laid her in a warm bed, and put ſtone bottles with hot water near her body. After that, he uſed the Tobacco-vapour pipe, and got the body well rubbed all over; which being done with aſſiduity, for half an hour, he then obtained the firſt ſigns of life, gave her ſome cordial drops in a glaſs of wine, and went on as before. She began to move reſtleſsly after a time, threw up ſome water, coughed, and ſeemed much oppreſſed, tho' ſhe had not then quite recovered her ſenſes. She got ſomewhat to drink, but could not keep it upon her ſtomach; ſhe then had an evacuation of another kind, and deſired to be allowed to ſleep, which ſhe did tolerably well for ſome hours, but then complained of an oppreſſion and great pain at her breaſt, which leſſened by ſlow degrees, and ſhe recovered, having long been tender and aſthmatic,

matic, for which reaſon this ſurgeon did not bleed her, but uſed all means to reſtore her to ſtrength ſpeedily, ſhe being the only ſupport of an old, decrepit, helpleſs mother.

CASE XXXV.

AT *Neykerk* in Friſeland, on the 24th of January, 1770, *Aafke Symons*, wife of *Jan Reinders*, fell into the Town Canal, lay under the ice for more than half an hour, before it could be broke enough to get her out; and by proper and diligent treatment afterwards, ſhe was brought to life again, and ſpeedily recovered.

CASE XXXVI.

AT *Hilverſum* in Friſeland, on the 10th of February, 1770, the ſon of *Myndert van Goch*, a child of about two years old, fell into a pit that had little more than a foot of water in it, yet a ſufficient quantity to drown the child, which lay in it with its head down and its heels upwards.

A man coming paſt, after it had lain about half an hour, took it out of the pit, and carried it home, where it was laid by for another half-hour, as dead; when Doctor *Francis Cordemans* propoſed to attempt its recovery. He proceeded in the uſual manner, brought it to life in ſome hours, and reſtored it to health in a few days.

CASE XXXVII.

AT *Rotterdam*, on the 26th of February, 1770, *Jan Kok*, a Bruſh-maker's lad, of fourteen years of age, drawing water out of the Canal early in the morning before it was light, fell in, ſunk under a boat, and remained there for half an hour. His maſter having ſought for him elſewhere, at laſt groped for him with a hook about the place where he generally took up water, and having found him, had him carried home as dead; but *Jan Hofman*, a Surgeon, ſent for, recovered him, and by proper means reſtored him ſo perfectly that he returned to his work in a few days.

CASE XXXVIII.

AT *Gouda* in South Holland, it happened on the 3d of March, 1770, that a girl of four years and a half old, the daughter of *Cornelis Krap*, was taken out of a canal drowned, and brought home. She was thought to be dead, was ſtripped, rolled up in a ſheet, and laid by to be buried. But ſome perſons coming in a while after, propoſed to make a trial of recovery, though ſhe was quite cold and ſtiff. They then proceeded to treat her, according to the Society's Inſtructions, very aſſiduouſly for the ſpace of two hours and a half, when they had the ſatisfaction of reſtoring her to life.

CASE XXXIX.

AT *Haarlem*, on the 3d of June, 1770, the wife of *Adrian Beſem*, aged forty years, was found in a canal where ſhe had lain for ſome time with her face downwards, as if ſhe had dropped into it in a fit of the falling-ſickneſs, which ſhe was ſubject to. She was taken out, and ſome time elapſed before ſhe could be treated for a recovery; but the proper means being at laſt uſed by *Jan van Tekelenburgh*, the Town Surgeon and Man-Midwife, ſhe was gradually reſtored to health.

CASE XL.

AT *Leuwarden* in Friſeland, on the 7th of June, 1770, a child of about four years old, called *Hilletje*, the daughter of *Jan Abrahams*, was taken out of a canal, in which ſhe had lain immerſed with her head downwards for more than half an hour: ſhe was ſtripped, warmed, and cheered for ſome time without interruption, and was perfectly recovered.

CASE XLI.

AT *Schiedam* on the Maeſe, on the 11th July, 1770, *Frederic Kleyn,* a man of twenty four years of age, fell from a boat into the north ditch of the town. A perſon who ſaw him fall in, went haſtily to his aſſiſtance in another boat, laid hold of the drowning man, and was himſelf pulled into the water. Some time elapſed before a third boat was got, and then he who laſt fell in was ſoon taken out: the other was not ſo readily found, having been long immerſed, and moved from the place where he fell in. He was however at laſt got out, laid on the bank, and ſhaken for the ſpace of fifteen minutes by two men who took him by his hands and feet, his face being downwards, and ſwung and agitated him, till they made him puke up ſome water. He was after that treated by *Gerrit Wiegerſhoff* and *Cornelis de Vos,* Surgeons,

geons, and by their endeavours brought back to life in a few hours.

CASE XLII.

AT *Amſterdam*, on the 24th of September, 1770, at four in the morning, an old man of ſixty-three years of age, called *Pieter Kalis*, miſtaking his way, fell into a canal, and remained more than a quarter of an hour immerſed before he could be found; but when he was got out, he was ſo properly aſſiſted by *Matthys Wageman*, *Cornelis Boef*, *Claas Houthuizen*, *John Ratrie*, and five more, that he recovered in a very ſhort ſpace of time.

CASE XLIII.

AT *Amſterdam*, on the 19th of October, 1770, *Gertrude van Greevingh*, a woman of thirty-four years old, wife to *Hendrik Harmſze*, a Mariner in the Eaſt Indies, going over one of the high bridges, turned her ankle, fell and ſlipped through the rails into the water, and by the current was carried away about twenty paces from where ſhe fell in. *Willem Cuyper*, who attempted to find her, though it was dark, met with ſeveral diſaſters, and at laſt, by the help of two other men, found the corpſe, and laid it upon the fore deck of a large boat, where they ſet her upon her head, to make her diſgorge water, and blew ſome Tobacco-ſmoke into her. She was then carried into a houſe, where ſhe was farther treated, and recovered ſo ſpeedily as to be ſent home in a carriage two hours and a half afterwards; notwithſtanding ſhe was immerſed more than an hour.

CASE XLIV.

At *Harlingen* in Friſeland, on the 16th of March, 1769, a child of *Thys Schild*, but eighteen months old, fell into a well, and was taken out quite lifeleſs. It was treated in the way as recommended by public authority, and recovered.

CASE XLV.

At the *Leidſendam*, a village between the *Hague* and *Leiden*, where, upon account of a large *Dam*, the paſſengers commonly leave one *Trekſchuit* at the entrance, to take another at the end of the place, it happened on the 28th of September, 1769, that *Mathias Frederic Palm*, being thirty-two years of age, had fallen aſleep in the former of theſe boats, and remained in it after all the paſſengers had left it. He then awaked, and haſtily in the dark endeavouring to get to them, took the wrong ſide of the boat, jumped into the water, and went to the bottom. Yet, ſtruggling to ſave himſelf, he came up again, and unfortunately ſwam away from the quay, and then, by the weight of his wet clothes, ſunk to the bottom, and came up no more. A maid ſervant by the water ſide, hearing his plunges, called to the ſkipper to know if any of his paſſengers were miſſing; whereupon they diſcovered the accident: they dragged the canal with long boat-hooks, and after a while the body was found, taken out, brought into the neareſt public-houſe, treated in a proper manner, and ſo well recovered, that in the ſpace of two hours, tired with the operation, he fell into a deep ſleep, and did not awake till next day, when knowing nothing of what had befallen him, he was in the utmoſt amazement to find every thing ſtrange about him.

CASE XLVI.

AT *Haarlem*, on the 22d of January, 1771, at ſix in the evening, *Maria Storm*, widow of *Gerrit Buitendyk*, a woman of ſixty-one years of age, miſtook her way in the dark, and fell into a canal called the *Oude Gracht*. She was luckily heard to fall in by another woman, who ſent her brother with ſome men to her aſſiſtance.—It was very dark, and blew a ſtorm; which made it difficult to find her with boat-hooks, without light, as none could be kept burning. As ſoon as they had found and got her out, they laid her upon a hand-barrow, with her face downwards, and carried her to a public houſe, where *Hendric Poor*, a Surgeon, came to her aſſiſtance, and after getting the women of the houſe to ſtrip and provide her with dry and warm clothes, treated her ſo ſucceſsfully, that in the ſpace of two hours and a half, ſhe was well enough recovered to be ſent home in a carriage; and that the next day ſhe ſtood no farther in need of the advice of Dr. *Adr. Dieten*, who had the day before preſcribed for her.

CASE XLVII.

AT *Meppel* in the Province of Overyſſel, on the 6th of February, 1771, a child of three years and a half old, the ſon of *Jan Munſterman*, fell into a frozen ditch behind his father's houſe, got partly under the ice, and remained there more than a quarter of an hour undiſcovered, till a ſhoemaker going by and ſeeing ſomewhat in the ditch, went nearer and pulled out the boy, who was immediately given to his mother then in ſearch for him: ſhe carried him home, to all appearance dead. *Durandus Bontjes*, a Surgeon, was ſent for, but could not be got in leſs than a quarter of an hour's time. As ſoon as he arrived, he took charge of the child, treated it according to the method recommended by public authority, and by a laudable perſeverance of more than two hours, obtained ſome poſitive ſigns of life; and at length he had the ſatisfaction to recover it. He aſcribed the ſucceſs of his treatment chiefly to his art of blowing wind in at the noſtrils, whilſt he held the mouth and lips cloſe; a diſcovery, by means whereof he ſaid he had quickened a child, that ſeemed dead at its birth.

CASE XLVIII.

AT *Edam*, a town in North Holland, on the 7th day of May, 1771, a child of near five years old, called *Abraham*, the ſon of *Roelof Harſma*, was found in the water by a woman, who thought it dead when ſhe took it out and carried it to its parents.—Yet, willing to try whether it was recoverable, ſhe haſtily cut its clothes off, wrapped it up in her woollen apron, and kept ſhaking it in her lap, till *Nicolas Weyertſz* and *Pieter Denker*, Surgeons, came to her aſſiſtance.——The child was then treated according to the General Directions known all over the country—ſome ſigns of life were obtained by an aſſiduous treatment of two hours; and by a farther continuance, in two hours more, other favourable ſymptoms appeared; and after a night's reſt, and not before, its ſpeech and ſtrength returned; and what is ſtill more remarkable, this child, which before was weakly, pale, and not thriving, became after this accident briſk, ſtrong and healthy, got a good colour, a lively eye, and grew conſiderably.

CASE XLIX.

AT *Delftshaven* on the Maeſe, near *Rotterdam*, on the 22d May, 1771, a Boy of four years old, the ſon of *Cornelis Bredius*, a Pavier, fell head foremoſt into a muddy ditch, and ſtuck in it for a quarter of an hour: his younger ſiſter, who had ſeen him fall in, could not ſooner give an intelligible account of the accident. When he was taken out, his limbs were ſtiff, his face black and blue, and a bloody froth ſtood upon his lips, as when a perſon has been ſtrangled. He was carried into a diſtiller's, where he was quickly ſtripped of his clothes, wrapped up in woollen things, and laid before the furnace-fire. He was rubbed firſt with dry cloths; and afterwards, all over, eſpecially on the ſpine of the back, the breaſt, and ſides, with Spirit of Sal Ammoniac, and Spirit of Hartſhorn in Brandy; which compoſition alſo ſerved to hold to its noſe, and to rub its head. But no ground being gained by theſe, all the body, excepting the head, was rubbed over with fine table ſalt—and after an alternate uſe of theſe things, for the ſpace of an hour, ſome very faint ſigns of life appeared; and at length there followed a diſcharge by ſtool, with wind: from that moment the heart began to move; in conſequence of which the child made the noiſe of one new-born. It was then wrapped in warm blankets, and put to bed with a ſtone bottle of hot water at its feet, and with a cordial mixture to take from time to time. It farther had ſome milk, after which it ſlept all night, and was the next morning very well recovered.

CASE L.

AT *Zoetermeer* in South Holland, on the 31ſt of May, 1771, a Boy about eight years of age, the ſon of *Simon Vander Lee*, a Miller, fell into the Mill-dam, was carried through by the cogs of the mill, and thrown out into the baſon where the water diſcharged itſelf. It was thence his father took him, after ten minutes immerſion, to all appearance dead. He was carried into the mill, ſtripped and laid before a fire, and an attempt made to get ſome brandy and vinegar down his throat, when unexpectedly he gave ſome ſigns of life: ſoon afterwards he ſeemed to groan and ſuffer, when it was firſt diſcovered that the upper part of the left arm, and his left thigh, were broken. Theſe fractures were committed to the care of *Nicholas Boſhuizen*, a Surgeon, and cured in fifty-three days time. It is remarkable, not only that the child eſcaped being cruſhed to pieces, but ſtill more ſo, that being luſty for his age, he was not more hurt by being forced through a paſſage of twenty inches by a water wheel of the breadth of eighteen inches, revolving within four inches of the bottom of the trough.

CASE LI.

NEAR the village of *Bleiswyk*, not far from Rotterdam, on the 25th of July, 1771, the ſon of *Cornelis van Gelderen*, a child of three years old, fell into a broad ditch called the *Bosſloot*, and was ſought for after having been loſt a quarter of an hour; it was at laſt found by a gardener, who took it out of the mud, in which it ſtuck with its head. Upon its being brought home, *Jan van Loedenſteyn*, a Surgeon, came to ſee what could be done with it, and was aſked by the byſtanders, "whether he "could reſtore the dead to life; for that "this child had been drowned for the "ſpace of half an hour?" He made no anſwer, but ſtripped it of its wet clothes, put it between blankets in a bed, rubbed its breaſt and back with hot cloths, chafed it with Spirit of Sal Ammoniac, and by theſe and other means recovered it ſo far as to diſcover certain ſigns of life, and laid it down to ſleep, which nevertheleſs was not without ſtartings and ſpaſms: the next day its belly was ſtill ſwelled, but by the uſe of proper medicines it was ſoftened and brought to its natural ſize; after which the child recovered perfectly.

CASE LII.

AT *Aarlanderveen*, on the 8th of Auguſt, 1771, at two o'clock in the afternoon, a child of four years old, the ſon of *Jacob Cornelisze vander Weyden*, fell into the water, remained undiſcovered for half an hour, was then found lying with its head down and its heels up, and taken out for dead. *Arnoldus Coomans*, a Surgeon living at a mile's diſtance, was ſent for, arrived in a quarter of an hour, and took charge of it: he found the child had been rolled upon a pail, and had been hung up by the feet; and the father was at that time ſitting with ſome neighbours by a fire, having the child upon his knees, and attempting by various means to recover it. The Surgeon examined it, ſaw not the leaſt appearance of life, yet ſtripped it of the wet clothes, and having put it into a blanket, proceeded to treat it according to the Public Directions: he alſo put a ſheath wetted with a cordial between its teeth, the better to diſcover any ſymptoms of life: after half an hour's aſſiduous treatment, the child began to catch its breath, to puke and to diſcharge; as ſoon as the heart was felt to beat, it began to cry, and uttered ſome broken words.—It was then put to bed, where by the uſual means it got warm, moved, ſpoke, and complained of pains in the breaſt, belly and back, the natural conſequences of the ill treatment undergone before his arrival; yet fortunately it did recover in a few days.

CASE LIII.

AT *Delft*, on the 21ſt of September, 1771, the child of *Cornelis Beyers*, between three and four years old, was brought home drowned, having lain more than half an hour under water. It was ſtripped, put between blankets, and by the direction of *Johannes Franciſcus Wilhelmus Spitz,* a Dentiſt, a ſtone bottle with hot water was applied to warm it.—Doctor *Diederic van Duyn,* who was ſent for, ordered *Spitz* immediately to bleed it, which he did without effect: They then together proceeded with the uſual treatment, and ſuceeded ſo well as to reſtore the child, in a great degree recovered, to its mother, by whoſe care and nurſing it came perfectly well.

CASE LIV.

AT *Amſterdam,* on the 6th of October, 1771, a Boy of eight years old, named *Johannes Serrenbach,* running along the ſtone wall in the town ditch, fell into the water, ſunk, and remained half an hour under it: being then taken out, and treated in a public-houſe, by the Surgeon *Johannes Philippus Pink,* according to the Publiſhed

Directions, he was recovered in a ſhort ſpace of time, and ſent home to his mother, a widow woman.

CASE LV.

AT *Harlingen* in Friſeland, on the 16th of November, 1771, between one and two at noon, the common dining hour in that place, M. B. an unmarried woman of fifty years old, of a healthy conſtitution, fell forward into the canal, as ſhe was drawing up a pail of water, and glided to the opopoſite ſide, where there was no quay, but a high dead wall. Half an hour paſſed before a boat was obtained, and ten minutes more to ſet a ladder and get her out. She then ſeemed dead, and was conveyed to a ſugar-houſe, where, by heat and rubbing, ſhe recovered ſo far as to ſpeak, and to complain of being exceſſively cold; upon which, ſhe was carried into the ſtove-room, where the ſugar is candied. She requeſted the door might be ſhut; but Dr. *S. Sinſtra* ſaid it ought not, as he knew the cloſe and rarified air of that place would affect her breathing, and oppreſs her: it was however at her repeated intreaty complied with; in conſequence of which, ſhe was carried home with a giddineſs in her head, and was ſoon after in agony for want of breath; her pulſe was weak and irregular, her aſpect ghaſtly, and a general coldneſs all over her body; upon the whole, in a very dangerous ſituation. Her weakneſs made the Doctor, who was again ſent for, take but little blood from her; and what was taken had no good effect: he ordered her a ſtrong purgative clyſter, and her arms and legs to be rubbed and warmed in bed as much as poſſible: ſhe then vomited up clear water, and had a large evacuation, which gave her eaſe: but that was of no continuance; ſhe was taken ill with a pleureſy, in which ſhe was twice blooded, treated as common practice in ſuch caſes directs, and recovered of it in the courſe of a fortnight, after which ſhe has enjoyed good health.

CASE LVI.

IN the Diſtrict of *Steenbergen*, not far from Breda, on the 27th of October, 1771, the wife of *Jooſt Melſeves*, travelling in a two-wheel carriage at nine o'clock at night, was overturned, and thrown into a deep muddy ditch, in which ſhe remained immerſed longer than half an hour, with the carriage upon her, the removing of which made a great difficulty of getting her out:—when that was compaſſed, ſhe was carried to the neareſt houſe, and an hour and a half more elapſed before a Surgeon could be got to her; when *Evert Baggers*, who was ſent for, came, and examining her, concluded her to be irrecoverably dead; yet following the treatment obſerved there, as well as in other parts of the Republic, he brought her to life again, and found, when ſhe could ſpeak, that ſhe ſuffered much from an oppreſſion upon her breaſt, to remove which he made her puke: ſhe appeared relieved, and was put to bed to her huſband; where having lain half an hour, ſhe raiſed herſelf up, ſaying ſhe could hardly breathe, and preſently fell back, had an involuntary diſcharge, and expired inſtantly.

The account does not mention any thing warm or comforting to have been given her, as in moſt of the other caſes.

CASE LVII.

AT *Workum* in Friſeland, on the 16th of February, 1772, at five in the evening, a Boy of eleven years old, called *Tietje Jans*, the ſon of *Jan Gerbrands*, being buſy near a ditch behind his father's houſe, fell into the water, and was not ſought for but on account of his long abſence; his ſtep-mother then ſent a little boy to look for him: he called about, and returned without finding him: on being ſent a ſecond time, he ran about; at length eſpying his brother's hat floating in the ditch, he called out affrighted for help: ſome neighbours came to him, diſcovered the accident, and dragging a hook along the bottom of the ditch, brought up the boy: doubting whether any life was left in him, one of them took him on his ſhoulder, head downwards, and ran about with him, ſhaking him as much as he could; but finding nothing gained by this trial, he was deemed dead, and carried home, where he was ſtripped and other means tried, when Doctor *Siffriedus Kramer*, who was ſent for, came in, bringing with him the Tobacco Clyſter-pipe and ſome Volatile Salts, which being uſed, and the rubbing continued an hour and a quarter, very promiſing ſigns of his recovery were obtained, and the boy was the next day perfectly reſtored to health.

His long immerſion, the rough treatment he firſt ſuffered, the time elapſed before regular aſſiſtance could be had, and the ſteady perſeverance in attempting the recovery, make this a ſtriking caſe.

CASE LVIII.

AT *Veendam*, a village in the province of Groningen, on the 8th of March, 1772, at ten o'clock at night, *Jan Harmſe*, a Farmer's Servant, of twenty-two years of age, fell into the *Weſterdiep*, ſunk, and remained half an hour under water:—when he was found and got out, he was rolled upon a caſk; and that appearing fruitleſs, he was carried home, where *Arnoldus Wyndels* an Apothecary took charge of him, almoſt without hope of ſucceſs. After two hours uninterrupted treatment, and not ſooner, the firſt ſigns of life were obtained, and a ſtill longer ſpace elapſed before any ſymptoms to be depended upon appeared. He was then put to bed, recovered gradually, had a tolerable night, and was not blooded until next morning, which was then done to relieve an oppreſſion upon his breaſt; ſome ſtrengthening things were alſo given him, and he was reſtored to health in a few days.

CASE LIX.

AS the ſailors were buſy lowering the yards and handing the ſails, on board a Dutch man of war, the *Orange Naſſau Weilburg*, lying before Leghorn, on the 18th of April, 1771, one of them, *Gerrit van Driebergen*, a man of forty-one years of age, fell overboard, unnoticed. The jobb of work they had to do being ended, ſome of the men on the larboard ſide ſaw a body floating upon the water, with its face downwards, and its head immerſed: they at firſt thought it to be a corpſe from another man of war, the *Zierikzee*, lying not far from them; but as ſoon as they diſcovered it was one of their own hands, two men, laſhed with ropes, let themſelves down, got hold of him, and brought him up into the ſhip. He had then lain about half an hour in the ſea, and ſeemed as dead as poſſible. Nevertheleſs the Surgeon of the ſhip, *Jan Nicolaas Flietner*, undertook the trial, whether life could be reſtored to him: he had him carried into the fore-caſtle, laid before the fire, ſtripped, and had dry clothes put on: he tried to bleed him, without effect; and he farther uſed the means directed to be employed on ſhore, and with equal ſucceſs; for in half an hour's time he began to puke and evacuate; and his blood beginning to circulate, in half an hour more, about eight ounces of it were by degrees got from the orifice at firſt made. He was then put to bed, continued to be rubbed, and as he gathered warmth he had ſome convulſive motions in his arms and face. Ten ounces of blood, then taken from him, cauſed a ſecond puking and evacuation, which compoſed him, and he fell aſleep. In the night he ſeemed delirious; but in the morning he was ſenſible and better, yet very weak and feveriſh. He was then ordered to drink a good deal of limonade; and with ſome farther care, in a few days, he recovered gradually, and became fit for duty again with the reſt of the crew.

CASE LX.

Publiſhed by the Directors of the Dutch *Society, by way of caution.*

A Boy of ten years old fell into the water, and after ſome ſtruggling, ſunk to the bottom; but was ſoon after taken up in a boat, in which he ſeemed not abſolutely dead. The perſon who carried him home from the boat, threw him unwarily over his ſhoulder, with his head and arms hanging down, in which ſituation, ſome water ran out of his mouth, and all ſigns of life left him. The means uſed for his recovery, were rubbing him with brandy and ſalt before a large fire, and blowing Tobacco-ſmoke up his inteſtines. He was bled at the jugular vein, and the arm, and only five ounces of blood were obtained. Two luſty perſons got into bed and took the boy between them, rubbed him for the ſpace of forty-five minutes: one of them often applied his mouth to that of the boy, to blow breath into him; all which was attended with no other effect, than that ſome phlegm ran out of his mouth. After two hours treatment, the Surgeon who had the direction of it, declared nothing more could be done, and pronounced the boy dead; whereupon he was laid out. Two hours afterwards, a gentleman, hearing of the accident, came to ſee the boy, and judging by his colour, the ſuppleneſs of his limbs, and the feel of his fleſh, that he was not quite dead, tho' very much ſwollen; he had him put between warm blankets, with hot bricks at his feet, and found that his body gathered warmth, and that his lips became red: he ordered farther care to be taken of him, intending from time to time to look after him: but having been longer abſent than he intended, he was ſuddenly called for, to ſee that the boy had loſt a ſurpriſing quantity of blood from the orifices in his neck and arm; upon which he ſent for the Surgeon who had bled him, with whom he made ſome farther attempts of recovery, but to no purpoſe, for in half an hour's time the body became quite cold and ſtiff.

A CASE *of periſhing by Cold.*

AT *Maeſlandſluis*, a town near the mouth of the Maeſe, on the 20th of December, 1771, *Cornelia Van Wyk*, an old woman of ſeventy-two years of age, of a very ſluggiſh habit of body, and a deſponding mind, took the deſperate reſolution of making away with herſelf. She choſe for that purpoſe a ſmall well behind her houſe, and about eleven in the forenoon ſhe attempted to drown herſelf in it; but its mouth being narrow, and covered with a wooden frame, her petticoat caught hold of the frame, as ſhe meant to ſlide down feet foremoſt: ſhe thus hung to the middle of her body in water; the upper part was in the mouth of the well, her head againſt the ſide, and her left hand upon the frame. In this ſituation ſhe was found by a neighbour, who accidentally came in to ſee her. This woman called out for help, and two men going by, came in: they were not able to get her out by a fair lift, ſo they looſened the frame from the bricks, pulled her up with it, diſengaged her, carried her into the houſe, and laid her down upon a blanket as dead. Her ſon, and a friend of his, *Frans de Jong*, a Surgeon's apprentice, were ſoon informed of the accident, came ſpeedily to her; and the young man knowing nothing more expedient, immediately opened a vein in her arm, and took about five ounces of blood.

When Dr. *J. Koole*, and the 'prentice's maſter, the Surgeon, had examined her, they reported that " not the leaſt appearance of life was in her; that her body was quite cold and ſtiff; that no pulſe could be found in her, nor any breathing; that her eyes were cloſed, and ſeemed ſoft." She was nevertheleſs undreſſed and put to bed, with hot cloths about her neck, and her arms and legs were rubbed. Spirit of hartshorn was held to her noſe, and her head and face were rubbed and chafed with it; ſome of it alſo was mixed up with brandy, put into her mouth, and attempted to be got down by the help of a feather put in to tickle her throat. With theſe and other attempts, in half an hour's aſſiduous treatment, her colour changed, ſhe began to breathe, and ſome motion was perceived in her extremities; in another half hour, ſhe was able to ſpeak; and in half an hour more, ſhe had recovered her ſenſes. After all which, and ſome farther phyſical aſſiſtance, ſhe got well again, only remaining ſomewhat weak.

This Caſe deſerves to be publiſhed, as an inſtance to ſhew, that in other apparent deaths, the means preſcribed to recover drowned perſons, may be uſed with good effect.

A CASE *of Suffocation with* Dutch *Turf-Coal.*

Klaas Dirkſe Kluys, of Haarlem, a man upwards of ſixty-three years of age, returning home, in the night-time, on the 17th November, 1770, with the Utrecht *Treckſchuit*, choſe the ſtern cabin for himſelf, took with him ſome Turf-coal not well lighted, and ſhut the hatch after him. Scarce had he lain down in bed, as he afterwards related, when he felt himſelf ſuddenly overpowered, and plunged into a deep ſleep, in which he was found the next morning, when at the landing-place, after ſeveral callings, the ſkipper ſtepped down to rouſe him, found him motionleſs, and as he thought dead, by Suffocation. Aſſiſtance was immediately called for; he was brought up into the air, was conveyed into a houſe on ſhore, where a Surgeon examined him, held ſome ſpirits to his noſe, chafed his temples with them, and attempted to bleed him on the hand; but all in vain. A Phyſician was then ſent for, who from the warmth of his hands and face, and the colour of his fleſh, though ſomewhat bloated, and from a faint motion in the pulſe and breaſt, formed ſome hopes of a recovery. He had ſome Spirit of Sal Ammoniac held to his noſe, and ordered ſome things which were not done during the time of a neceſſary abſence, in which alſo they conveyed him to another more airy place; where, at the Doctor's return, a Bliſter was applied to each of his legs; a Clyſter of Tobacco-ſmoke was introduced, and a bleeding was performed at his arm. The uſe of the Spirit of Sal Ammoniac was continued, and his breaſt was rubbed with cloths dipped in warm brandy: his breathing then appeared ſtronger, and his pulſe was better felt; but he ſtill remained inſenſible, motionleſs, and in the ſame deep ſleep. Next day the perſon who nurſed him reported, that during the night he had by degrees ſwallowed ſome ſtrong wine put into his mouth in ſmall quantities; upon which the Doctor ordered him ſome *Mixtura Cephalica ſpirituoſa* to replace the wine, and to be given in the ſame manner; which cauſed ſome wry faces as it went down. His power of ſwallowing becoming better, he had ſome ſmall liquor, as well as wine, given him from time to time: yet, as he ſtill remained inſenſible, with his eyes open, and his diſcharges were involuntary, another bliſter was applied to his neck. The ſecond day his pulſe was freer. He had a ſtronger clyſter, which cauſed a great diſcharge downwards, and a ſmaller upwards. Soon after that he was bled nine ounces at the arm: he had a paſte of horſe-radiſh, muſtard, ſalt, and ſour dough, put to his feet. The third day he anſwered by monoſyllables when loudly ſpoken to, but ſcarce yet moved. He was ſtill rubbed, particularly along the back bone, with a Volatile

Spirit, and had another clyſter. The fourth day he became ſenſible, and the rubbing was continued. The fifth day he recovered his ſpirits, and ſaid he found himſelf quite well; and the ſixth, he returned home with ſome relations who came to fetch him.

The following Caſes were tranſmitted from different Boards of Health in Italy, *to the Directors of the Society at* Amſterdam.

Extract of a Letter from Profeſſor Giacomo Maggioni *to the Magiſtrates at* Padua.

On the 3d of May, 1766, an accident gave me an opportunity of obeying the injunctions of the Honourable Board of Health, concerning drowned perſons. *Andrea* the Son of *Giovanni Beſſa*, ſeven years old, playing with other children, fell into the river *Brenta* near St. Leonard's bridge, and was carried down by the ſtream to the Mill bridge. He could not be come at in leſs than twenty-five minutes, when *Pietro Stephanin* got him out. I then ſtepped forward, and found the people rather injuring than helping the child. There was not the leaſt ſymptom of life about it. When I turned it, the face was black and blue, the mouth was covered with froth, and the belly was ſwollen up. I began the treatment by blowing wind into the mouth, and directed the body to be rubbed; but, as my operations were obſtructed, I got the boy carried to a neighbouring bake-houſe. As ſoon as he was there ſtripped and wiped dry, he was laid into a bed, and rubbed continually. I preſſed his belly upwards to facilitate reſpiration: I held Spirit of Balm to his noſe; and after thus cheering him for half an hour, I had the ſatisfaction to ſee him recover, and ſpeak with his playfellows: his pulſe beat freely, he breathed with eaſe, and had diſcharged about three ounces of water. No complaint remained but a feveriſh heat, for which I ordered three ounces of blood to be taken, and a little Balm Water to be given; after which he perfectly recovered.

Extract of a Letter from Andrea Antonini, *a Surgeon, to the Magiſtracy of* Baſſano.

On the 11th of July, 1769, I was called to the houſe of *Marco Antonio Scolari,* on the banks of the *Brenta,* and was there informed, that *Bartolo Gabardo,* a Boatman of *Valdagna* in the *Vicenteze,* had fallen into the river at half an hour after three, and was carried downward with the current a quarter of a mile; that at four o'clock he had been taken out by his fellow boatmen, and brought to that houſe; and that in compliance with the ordonnance of 24 Dec. 1768, I was ſent for. I found the body in all reſpects like that of a dead perſon. As ſoon as it was ſtripped, it was put to bed, and rubbed all over with warm linen cloths, during half an hour, to the effect of producing a degree of warmth. I then perceived ſome faint reſpiration, and gave him ſome of Dr. *Bernardino Sarraglia*'s *Alexipharmac*, a medicine of great repute in ſuch circumſtances. By thoſe means the blood and humours began to flow, and the lungs to play. The Patient coughed a good deal, and I conſidered that as a forerunner of his recovery. He ſlept two hours in a profuſe ſweat, and awaked quite compoſed. In the evening I bled him a ſecond time, in the foot, to give more room for circulation. He paſſed the next day very well, obſerving the regimen I had preſcribed him; and the third day, his ſtrength being reſtored, he returned home.

Extract of a Letter from Doctor Franſiſco Antonio Caneſtrari, *to the Magiſtrate of* Verona.

FIRST LETTER.

On the 22d of October, 1769, at the harbour of the river, at three o'clock, an unhappy woman threw herſelf from the New Bridge down into the water, and was carried away by its current. Some watermen pulled her up with their boat-hooks, at a quarter of a mile's diſtance from the new bridge. As ſoon as theſe men had laid her down upon the bank, I went quickly to her. She was pronounced dead. I reſolved, nevertheleſs, to try the uſe of ſuch means as our Sovereign has directed. I laid my lips to her's, and blew as much wind into her lungs as I poſſibly could. At the end of ſeven minutes, I perceived ſome motion; I continued the operation with a hollow probe then brought me, and convinced myſelf that there ſtill was life in her. She was then carried to a baker's, where ſhe was begun to be rubbed: the black and blue colour of her ſkin diſappeared, and ſhe got her former looks again; there was nevertheleſs a great embaraſſment in her breathing: I had her blooded in the right arm, by *Borghi* the Surgeon, who farther aſſiſted me in the treatment: but the bleeding not anſwering my expectation, I got the patient carried to the hoſpital of Mercy, where at her entrance ſhe ſaid her name was *Barbara Dorighini*, and that ſhe lived at St. *Zeno.* It is probable ſhe will ſuffer much by the oppreſſion ſhe complains of, as alſo by the hurts received from her being forced by and over piles, poſts, and ſtones, by the current.

SECOND LETTER *from the ſame.*

Since my letter on the ſubject of *Barbara Dorighini*, I have to report, That when ſhe came into the hoſpital ſhe could ſcarcely ſpeak intelligibly, and complained much of being exceſſively cold: ſhe did not entirely recover her ſpeech and ſenſes till the evening: ſhe had violent reachings, and brought up rediſh water, from a quantity of grapes ſhe had eat, which perhaps had given that colour to the froth upon her lips, which I had taken to be bloody. I ordered her to be rubbed conſtantly: her pulſe remained very weak, but ſhe breathed more freely: ſome veal broth and a cordial were ordered; and though a bleeding ſeemed needful, it was moſt prudent to defer it, upon account of the great cold ſhe ſuffered. She had a tolerably good night, and in the morning her pulſe was freer, the ſenſation of cold was gone, ſhe breathed with more eaſe, but ſtill complained of a violent pain in her head. I had her bled twice, with the happieſt effect, for ſhe felt no remains of her complaint, but great weakneſs.

After ſhe left the hoſpital, I continued viſiting her during eight days, in which time her recovery was amazing, and the more ſo, as ſhe was ſixty-five years of age.

The Boards of Health, to which theſe Caſes are reported, have beſtowed marks of honour upon the perſons who directed the Cures.

A CASE *imparted to the Society, from* Liſle *in* Flanders, *is as follows:*

ON the 10th of February, 1770, *Robertine Dubrul,* a young woman of nineteen years of age, fell into the river called the Low Deuſle, and when ſhe was got out, had not the leaſt ſign of life about her. As ſoon as ſhe was got into a neighbouring houſe, every thing poſſible was attempted for her recovery. She was ſtripped of her wet clothes, and laid upon a mattreſs before a good fire, where Dr. *Savarin,* and Mr. *Pionnier* a Surgeon, applied the Tobacco clyſter-pipe, the operation of which very ſoon produced the deſired effect; in a few minutes a bloody froth flowed out of her mouth and noſe, and immediately ſhe threw up with violence what was in her ſtomach mixed with water; after which ſhe opened her eyes, and in ſome meaſure recovered her ſenſes: her pulſe began to beat: ſhe ſpake, and complained that ſhe was exceſſively cold, that ſhe was frozen. Whilſt the

Surgeon continued the uſe of the Tobacco-pipe, he diſcovered that her belly grew warmer: ſhe then called for a bed-pan, and parted with a good deal of wind. A quantity of hot aſhes being put between folds of linen, they were tied about her head and feet to warm theſe parts. Her body was rubbed with hot cloths during the ſpace of two hours. As ſoon as ſhe could ſwallow, an oily mixture was given by ſpoonfuls every hour, with an infuſion of vulnerary herbs. An emollient clyſter was adminiſtered in the evening, and ſome *theriaca* was applied to her ſtomach, at the place where ſhe felt pain. At ten o'clock another clyſter was given, and a conſiderable diſcharge obtained in the night; and next morning, when her pulſe was hard and quick, ten ounces of blood were taken from her foot: it ſprung in a ſtream, and as the fever did not leſſen, and her blood was inflamed, ſhe was bled twice more that day. The pain in her ſtomach continued alſo; a pultice of leeks, with the vegetable mineral of Dr. *Goulard*, was applied to the part, and that, with the bleeding, removed the pain in a few hours. The patient reſted very well the following night; a profuſe ſweat made the fever to diſappear the third day: a careful and nouriſhing diet reſtored her ſoon after; and ſhe enjoys at this time, the 28th day of February, a perfect ſtate of health.

A Society for the advancement of Arts and uſeful Knowledge at Hamburgh, have publiſhed ſome directions for the recovery of drowned perſons; the obſervance of which has been enjoined by the magiſtrates of that city; and ſeveral Caſes of ſucceſs have by order been imparted to the Society at Amſterdam; but they are drawn up in ſo ſhort a manner, as not to convey that uſeful inſtruction expected from them. The tranſlation of one of theſe Caſes will ſhew that no advantage can be reaped by publiſhing more.

" On the 4th of October, the ſon of a Captain of
" an Engliſh veſſel trading to this port, fell into the
" water, lay immerſed half an hour, was taken out,
" brought to life again, and perfectly recovered in a
" few days."

⁂

THE Inſtitution mentioned page 7. as under conſideration in France, appears already to have taken place at Paris, and to be made a part of the good police of that city. It is there entirely under the direction of the civil magiſtrate: rules have been publiſhed, eſtabliſhing the methods to be purſued when a drowned body is found: the neceſſary implements to be uſed in reſtoring life are depoſited in fifteen different places in the city; that they may be always ready for uſe, the keeper of them is enjoined to carry them where-ever they are wanted, if the body cannot be carried to the neareſt guard-room, as is generally required. A reward is given to the perſon who firſt carries to a guard-room intelligence of an accident. Another reward is given to him that has got the body out of the water, and attempted to ſave a life, and purſued the proper meaſures for the recovery. A report of the caſe is always as ſoon as poſſible to be made to the police. Beſide theſe rewards, the magiſtrates promiſe to pay the charges incurred through neceſſity, and certified by proper perſons. And, leſt a well-meant attempt be left unrewarded, or any one be diſcouraged by want of ſucceſs in their endeavours, a moiety of the full reward is given in unſucceſsful caſes.

It is farther ordered, that the utenſils depoſited in the guard-rooms be inſpected once a month; and freſh inſtructions be given to the attendant there as often as neceſſary. It is alſo uſefully provided, that an exact account be annually publiſhed, not only of the recoveries, but alſo of ſuch caſes as have not been attended with ſucceſs; and likewiſe of others, where relief has not been attempted, with the reaſons; in order to convey inſtruction, and throw more light on the ſubject.

The French publication, which gives an account of this inſtitution, informs us, that in nine months after its being generally known, twenty-eight drowned perſons were treated according to directions (ſimilar to thoſe at Amſterdam), and that twenty-three of them were recovered.

It ſeems to be an overſight in this well-concerted plan, that no honorary premium has been thought of for perſons who are above accepting any pecuniary reward.

The foregoing Caſes afford proof ſufficient of a ſurpriſing ſucceſs in recovering drowned perſons. Other publications in England help to demonſtrate, not only the practicability of that, but farther prove that the means uſed with ſo much efficacy in recovering drowned perſons, are, with equal ſucceſs, applicable to a multitude of caſes, where the animal powers ſeem in reality to be only ſuſpended, and to remain capable of renewing all their functions, on being put into motion again. There are too many inſtances, where the want of this conſideration has been attended with the moſt unhappy conſequences; and perſons have been committed to the grave, in whom the principles of life might have been revived.

The following Caſes are taken from the Gentleman's Magazine.

A Journeyman Shoemaker, in *Reading*, as he was waſhing in the *Kennet*, near *Blake's* bridge, fell into a hole out of his depth; and as he could not ſwim, he ſtruggled ſome time, then ſunk under water, but roſe three times, as is ſaid to be uſual, and as often ſunk to the bottom. A young lad attempted to ſave him, whoſe wriſt he graſped with his hand, and held it faſt, but the lad not having ſtrength to keep the man and himſelf above water, it was with difficulty that he diſingaged himſelf, and ſaved his own life. After this the man was ſeen to ſtand ſome time erect on the ground in the water (which was about nine feet deep) and then to fall flat on his belly to the bottom, where he lay without the leaſt motion, when one Mr. *William Wood*, a gentleman of undoubted veracity, who gave moſt of the particulars,

ne by, and being informed that a man
s drowning, he went down from the
dge to the river's ſide, and after ſome
nutes ſpent in various ineffectual endea-
ırs to get a ſight of the body, he at
gth ſucceeded, and then pulled off his
at and waiſtcoat, hat and wig, and jump-
into the river, in order to fetch him up;
t when he endeavoured to dive, he could
t ſink, by reaſon of his ſhirt, ſo that he
s forced to come out again to pull that
, which made the delay conſiderably
nger, as his wriſtbands, ſtock and neck
re to be unlooſed, and after all his ſhirt
ıck ſo cloſe to him, that it was not eaſy
ſtrip it over his head. He them jumped
a ſecond time, and being directed by the
ectators to the ſpot where the man lay,
dived down, laid hold of his arm, and
ew him to ſhore, where he was taken
without any ſigns of life, and all pre-
nt gave him over for dead; but while the
rry and crowd continued, a perſon, who

it

it is ſuppoſed had read the Magazines, came by, and adviſed firſt of all to lay him on his belly acroſs a timber log, with his head downwards, ſo as to let the water run out of his mouth, &c. this was accordingly done, and he had ſcarce remained a quarter of an hour in this ſituation, and was quite emptied, when he was perceived to heave; and when no more water would come forth, he was carried home; and proper care being taken of him, in leſs than two days he was ſo well recovered, as to be able to follow his buſineſs.

TRAVELLING laſt week between *Farnham* in Surry and *Odiham* in Hants, I providentially loſt my way, and came to a place called *Dipley Mill*, where a female voice invaded my hearing, with the moſt piercing cries. At firſt, as it was a lonely place, I imagined there were thieves in the houſe; but that thought as quickly vaniſhed as it was conceived, and I fancied ſome woman,

man, ignorant of the manner of a mill, had got her clothes within the wheels, and that it was overpowering her: I jumped off my horſe, and was ſoon in the mill, with my penknife in my hand, ready to cut the perſons clothes, and clear her from the wheel; when I ſaw a woman in a frantic poſture, and an old millar of ſeventy years of age, as much ſtupified as ſhe was agitated, my firſt conception was obliterated by the ſight of a dead child that hung a croſs her left arm, and crying out: *O Lord I have loſt my huſband, and now my child is drowned; I'll live no longer! I'll drown myſelf!* and throwing herſelf forcibly againſt the ground, on the verge of a turf head of water, had nearly effected her reſolution, if I had not catched hold of her arm and prevented it. Upon this I reaſoned with her to ſoothe her ſorrow and preſerve herſelf; but finding ſhe grew worſe by that kind of perſuaſion, I recurred to the child, and told her it would come to itſelf again in a little time: not that I really did believe it ever would do ſo, but tried this method to comfort her: for the hands were as black as a ſhoe with congealed blood, or ſomething like it; the eyes were ſet, and the tongue partly out of the mouth. However, to carry on the fallacy, I ordered the miller to hold it up by the heels, and drain ſome of the water out of it, as I had heard was the practice in like caſes, but without any hopeful effect, a very few drops only ooſing ſlowly from the paſſages of the head. On this I recollected what I had read ſome years ſince concerning drowned perſons, and ordered the woman to fetch a pair of bellows: but having no faith in ſo unlikely a remedy, ſhe refuſed to go for ſome time, and then ſent a little girl of four years old, who made no haſte to return. When the bellows came, I directed the woman to apply them to the poſteriors of the child; and after half a ſcore blaſts it began to ſigh, and ſoon after moved the mouth and eyes: the bellows being ſtill kept to work, 'till it began to cry luſtily and enter into full life again. I then ordered the mother to pull off the wet cloaths, and put it into a warm bed. On taking my leave I expected the woman would have thanked me in the uſual manner; but being in a lonely place where breeding of that ſort is perhaps unknown, ſhe only ſaid to the miller her man, ' *'tis well the mon hoppend to com this woiy.*'

Cirenceſter, May 28.

TWO boys went into the *Thames* near *Hampton*, and ſoon after one of them ran up the beach, and ſaid his companion was drowned; on which one *Ruſt* a fiſherman took his punt and ſhove to him immediately; and ſeeing him lay in a hole about ſix feet deep, he pulled him up with his hitcher, and carried him upon the beach where he was rolled and blooded; but it was twenty minutes before any life appeared in him. He then came to himſelf, and was carried to the Red Lion in *Hampton*, where, being put to bed, he ſoon recovered.

SOME time ſince an Engliſh veſſel being in the river *Douro*, at *Oporto*, a ſailor accidentally fell overboard. He continued under water full half an hour, when, being found, he was immediately ſtripped, and rubbed all over with ſalt, but more particularly about the temples, breaſt, and joints. This operation was continued for ſome time, during which the Patient began to ſhew ſome ſymptoms of life; not the leaſt appearance of which were to be ſeen before: and in leſs than four hours, to the great ſurpriſe of every body, he came ſo entirely to himſelf, that he was able to walk.

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Abſtract of a Memorial of Dr. John Fothergill, *publiſhed in the* Tranſactions of the Royal Society.

THERE are ſome Facts, which in themſelves are of ſo great importance to mankind, or which may lead to ſuch uſeful diſcoveries, that it would ſeem to be the duty of every one under whoſe notice they fall, to render them as extenſively publick as it is poſſible. The caſe which gives riſe to the following remarks is of this nature.

“ A perſon ſuffocated by the nauſeous “ ſteam riſing from coals ſet on fire in a “ pit near *Alloa* in Scotland, fell down as “ dead; he lay in the pit between half “ an hour and three quarters; and was “ then dragged up: his eyes ſtaring open, “ his mouth gaping wide, his ſkin cold; “ not the leaſt pulſe in either heart or ar- “ teries; not the leaſt breathing to be obſerved.”

In theſe circumſtances, Mr. *Toſſack*, the ſurgeon who relates the caſe, "applied his "mouth cloſe to the patient's, and, by "blowing ſtrongly, holding the noſtrils at "the ſame time, raiſed his cheſt fully by "his breath. He immediately felt ſix or "ſeven very quick beats of the heart; the "thorax continued to play, and the pulſe "was ſoon after felt in the arteries. He "then opened a vein in his arm, which af-"ter giving a ſmall jet, ſent out the blood "in drops only for a quarter of an hour, "and then he bled freely. In the mean "time he cauſed him to be pulled, puſhed, "and rubbed as much as he could. In one "hour the patient began to come to him-"ſelf; within four hours he walked home, "and in as many days returned to his "work."

There were many hundred people, ſome of them of diſtinction, preſent at the time.

It may be a proper inquiry in what caſes, and under what circumſtances there may be a proſpect of applying this, and other ſimilar methods, with ſucceſs.

The diſeaſes in which they may be of uſe, are thoſe called ſudden deaths from an inviſible cauſe, apoplexies, fits of various kinds, as hyſterics, faintings, and many other diſorders, wherein perſons in a moment ſink down and expire.

The various caſualties in which they may be tried with a proſpect of ſucceſs, are many: ſuffocations from the ſulphurous damps of mines, coal pits, &c. the condenſed air of long unopened wells or caverns; the noxious vapours ariſing from fermenting liquors received from a narrow vent; the ſteam of burning charcoal; ſulphurous mineral acids; arſenical efluvia, &c.

Perhaps thoſe who to appearance are ſtruck dead by lightning, or any violent agitation of the paſſions, as joy, fear, ſurpriſe, &c. might frequently be recovered by ſtrongly blowing into the lungs, and by that means communicating motion to the vital organs.

Malefactors executed at the gallows, would afford opportunities of diſcovering how far this method might be ſucceſsful in relieving ſuch as may have unhappily become their own executioners by hanging themſelves. It might at leaſt be tried: the only ill conſequence that could accrue from a diſcovery of this kind, would be eaſily obviated by prolonging the preſent allotted time of ſuſpenſion.

This method may conduce to the ſaving of a great many lives, as it is practicable by every one who happens to be preſent at the accident, without loſs of time, without expence, with little trouble, and leſs ſkill; as it is perhaps the only expedient of which it can be juſtly ſaid, that it may poſſibly do *great good*, but cannot do harm.

A caſe of a young man ſtupified by the ſmoke of ſea-coal, by Dr. Frewen, *of* Suſſex, *publiſhed in the* Philoſophical Tranſactions.

WILLIAM COLEBROOK, a lad of ſeventeen years of age, was left alone to the care of his maſter's veſſel, in Rye harbour, the 4th of June, 1761, and ſhutting up all cloſe, at nine o'clock in the evening, he laid himſelf down to ſleep in a ſmall cabbin, where there had been a ſea-coal fire, which was not properly extinguiſhed, and the chimney place being ſtopped, it ſoon grew full of ſmoke; the effect of which, when the people came on board next morning, proved to have been ſo powerful, as to render him totally deprived of all the ſenſible motions of the body, excepting thoſe of the heart and lungs. The cauſe of this ſtupor being preſently ſuſpected, he was brought out upon

The next day I found him much better; when he ſat up, talked, and drank ſome tea. His breathing was eaſier, but he complained of a ſhort troubleſome cough; and hoarſeneſs; for which I ordered him a ſmooth pectoral tincture and a lenient purging draught was alſo given him, which had the deſired effect. He continued growing better for a day or two, when I called upon him again, and finding his cough and hoarſeneſs ſtill remain, with a little ſhortneſs of breath, I directed him pills of millepedes and gum ammoniac, made up with bal. ſulph. to be taken twice a day, drinking warm milk after them; by which means he grew perfectly well, and went to ſea in twelve days.

Abſtract of a letter from the Gentleman's Magazine, *about a natural recovery from apparent death.*

MANY wonderful ſtories have been told of perſons being dead, in the common acceptation of the word, for ſeveral days, and then reviving, or coming to life again. I ſhall give a very recent inſtance of a woman's recovery, after being to all appearance dead, and ſo thought to be by every body that ſaw her.

Mrs. *Fudge*, at *Maraſion*, in *Cornwall*, aged above eighty, ſeemed for many years gradually to decline, and towards the end of September laſt took to her bed, and in a few days ſeemingly expired in the morning. As ſhe had often deſired not to be buried till ſhe had been two days dead; her requeſt was to have been religiouſly complied with by her relation, a woman of veracity, who informed me of theſe particulars, for I had not an opportunity of ſeeing her myſelf: however, all that did, looked upon her as dead, and the report was current through the whole place; nay, a gentleman of the town, actually wrote to his friend in the iſland of *Scilly*, that ſhe was deceaſed: but to proceed, one of thoſe who were paying the laſt kind offices of humanity to her remains, perceived ſome warmth about the middle of her back, and acquainting her friends with it, they applied a mirror to her mouth; but after repeated trials, could not obſerve it in the leaſt ſtained; her under jaw was likewiſe fallen, as the common phraſe is; and, in ſhort, ſhe had every appearance of a dead perſon. All this time ſhe had not been ſtripped or dreſſed, but the windows were opened, as is uſual in the chambers of the deceaſed. In the evening the heat ſeemed to increaſe, and at length ſhe was ſeen to breathe.

From the account I had, ſhe could not be leſs than twelve hours without any perceivable motion, and it was not till next day that I heard ſhe was come to life again; I muſt confeſs that at firſt I laughed at the report, as I knew ſhe was of a great age, and had not died ſuddenly; however, upon enquiry, I found it had actually been ſo, and ſuch an uncommon occurrence made a great noiſe in the place.

A ſwooning after delivery.

Dr. J. ENGELMAN in a Diſſertation on the various cauſes of ſuffocation, pointing out the effects of the ſtrength being exhauſted, relates the following caſe:

" A woman in childbed being happily
" delivered, ſuddenly fainted, loſt all ſen-
" ſation, lay upwards of a quarter of an
" hour apparently dead, pale as a corpſe,
" with ſcarcely any perceptible motion in
" her pulſe. A phyſician was ſent for;
" her own maid in the mean while being
" out of patience at his delay, attempted

" to aſſiſt her herſelf, and extending her-
" ſelf upon her miſtreſs, applied her mouth
" to her's, blew in as much breath as ſhe
" poſſibly could, and in a very ſhort time
" the exhauſted woman awaked as out of
" a profound ſleep; when proper things
" being given her, ſhe ſoon recovered.

" The maid being aſked how ſhe came
" to think of this expedient, ſaid, ſhe had
" ſeen an inſtance of it's ſucceſs at *Alten-*
" *burg*, where the ſame practice was uſed
" by the midwives with children, to the
" happieſt effect."

A child overlaid by it's nurſe.

IT appears by a late Publication in the *London Chronicle*, that Monſieur *Janin*, of the Royal College of Surgery at Paris, relates in a Memoir now in the Preſs, that
" a nurſe having had the misfortune to
" overlay a child, he was called in, and
" found the little victim without any Signs
" of life; no pulſation in the Arteries, no
" reſpiration,

" reſpiration, the face livid, the eyes open, " dull and tarniſhed, the noſe full of ſnivel, the mouth gaping, in ſhort it was " almoſt cold. Whilſt ſome linen cloths " and a parcel of aſhes were warming, he " had the boy unſwathed, and laid him in " a very warm bed, and on the right ſide. " He then was rubbed all over with fine " linen, for fear of fretting his tender and " delicate ſkin. As ſoon as the aſhes had " received their due degree of heat, Mr. " *Janin* buried him in them, except the " face, placing him on the ſide oppoſite to " that he had been at firſt laid, and covered " him with a blanket. He had a bottle " of Eau de Luce in his pocket, which " he preſented to his noſe from time to " time, and between whiles ſome puffs of " tobacco were blown up his noſtrils; to " theſe ſucceeded the blowing into his " mouth and ſqueeſing tight his noſe: " animal heat began thus to be excited gra- " dually; the pulſations of the temporal

“ artery were ſoon felt, breathing became
“ more frequent and free, and the eyes cloſed
“ and opened alternately. At length the
“ child fetched ſome cries expreſſive of his
“ want of the breaſt, which being applied
“ to his mouth, he catched at it with avidity,
“ and ſucked as if nothing had happened
“ to him. An attention in care, which
“ ſcarce laſted above half an hour, was sufficient
“ for calling back to life this poor innocent.
“ Though the pulſations of the arteries
“ were very well re-eſtabliſhed, and it was
“ hot weather, the child was ſtill left three
“ quarters of an hour under the aſhes. He
“ was afterwards taken out, cleaned and
“ dreſſed as uſual, and a gentle ſleep succeeding,
“ no farther accident happened to
“ him. The child remains ſtill full of life
“ and vigour. Mr. *Janin* adds, that it
“ would be difficult to paint the deſpair
“ and conſternation the poor nurſe appeared
“ in when he entered the houſe; and much
“ more the exceſs of joy ſhe delivered her-

“ ſelf up to, on ſeeing her nurſe child “ brought to life.

Mr. *Janin* cites likewiſe an example of a young man who had hanged himſelf through deſpair, to whom he adminiſtred help as effectually as in the preceeding Caſe.

The whole of the memoir and theſe examples evidently prove the poſſibility of bringing back to life, not only drowned perſons, but thoſe alſo that may be ſtifled and hanged. This ſhould therefore make us conceive the beſt hopes of the ſucceſs of adminiſtring help to perſons ſtruck with ſudden death, or hurt by any other accident. Among the hiſtorical facts relative hereto, Mr. *Janin* has not omitted the melancholy end of Cardinal Spinola, who had contracted an illneſs from ſome occaſions of vexation, a caſe wherein proper aſſiſtance, would not have left the patient expoſed to the fatal ſtrokes of inattention and impatience.—The memoir is concluded with this reflection: How many other ſimilar facts are there, quite ſhocking to humanity, which muſt accuſe us of neglect in ſeconding the reſources of nature!

The caſe of a child which ſeemed to expire in a convulſion fit: communicated by a private hand.

IN the pariſh of *St. Clemens* at *Colcheſter*, the ſon of R. T. a child of ſix months old, laying upon it's mother's lap, having had the breaſt, was ſeized with a ſtrong convulſive fit, which laſted ſo long, and ended with ſo entire a privation of motion in the body, lungs, and pulſe, that it was deemed abſolutely dead, and ſo poſitively believed by the family, that it was ſtripped and laid out, the paſſing-bell was to be tolled, and a coffin ordered. But a neighbour, one Mrs. C. who uſed to admire the child, and had ſeen and kiſſed it in arms not an hour before, hearing of it's ſudden death, haſtened to the houſe, found the mother bathed in tears, enquired what had happened, and by the ſhortneſs of time ſcarce believing the child dead, went to examine it; found it not cold, it's joints limber, and fancied that a glaſs ſhe held to t's mouth and noſe was a little damped with reath; upon which ſhe took the child in er lap, ſat down before the fire, rubbed t, and kept it in gentle agitation. In a quarter of an hour ſhe felt the heart begin o beat faintly, ſhe then put a little of the mother's milk into it's mouth, continued o rub it's palms and ſoles, found the child egan to move, and the milk was ſwallowd; and in another quarter of an hour ſhe ad the inexpreſſible ſatisfaction of reſtoring the diſconſolate mother a ſweet babe, uite recovered, eager to lay hold of the reaſt, and able to ſuck again.

The little boy throve and did well afterards, had no more fits, is grown up, and preſent alive.

A Recovery to Life after Twenty-nine Minutes hanging; a Caſe treated and communicated by Mr. Glover, *Surgeon in* Doctor's Commons, London.

AT the latter end of September 1766, *Patrick Redmond,* a Taylor, in the city of *Corke*, in Ireland, aged about thirty three, of an athletic make and full habit, was condemned to be executed for a ſtreet robbery; the night before the ſentence of the law was to take place, Mr. *Glover* happening to be in company with Dr. *Sleigh* and ſome other gentlemen of the Faculty, the diſcourſe turned on the means of affording the moſt effectual relief to drowned or hanged perſons, when Mr. *Sullivan,* who had before expatiated on the utility of experiments on the dead for the benefit of the living, prevailed on Mr. Glover to promiſe to attempt every thing poſſible for his recovery. After the culprit had walked to the gallows and been turned off a ladder, as is cuſtomary in thoſe parts of Ireland, having hung twenty-nine minutes within a few ſeconds, by a ſtop watch, and ſhewed no ſigns of life after the firſt four minutes, he was, on the Sheriff's retiring, cut down, and carried to a field near the place of execution, where Mr. G. opened the temporal artery and the external jugular, but the circulation ſeemed intirely ſtopt, a ſmall portion of coagulated blood only appearing at each orifice. The body was then ſtripped, and the back, mouth, and neck rubbed with a quantity of volatile ſpirits and oil. The tobacco glyſter was alſo adminiſtered by means of lighted pipes, covered on the bowl with ſtrong paper pricked full of holes, and his arms and legs continually ubbed by the mob, who were very numerous, and cheerfully afforded their aſſiſtance. In this courſe they continued from wo of the clock till near ſix in the evenng, when Mr. G. made an inciſion through the ſkin into the wind-pipe in the uſual manner, and blew ſtrongly through a canula into the lungs. About twenty minutes after, the blood at the artery began to run down the face, and a ſlow pulſe was juſt perceptible at the wriſt. At this critical period, news was brought that the Sheriffs had heard of the ſteps which were taken to recover the man, and had ſent the conſtables and ſome ſoldiers to ſecure the body. The hoſpitable peaſants redoubled their efforts at this intelligence; a ſhort time after the blood came ſo plentifully from the artery, that it was thought neceſſary to ſtop it, which was eaſily done, by placing a half-penny in a bit of rag, and tying it over the part. A little after ſeven the pulſe beat faintly near forty ſtrokes in a minute, and the patient's mouth and noſe being irritated with a little ſpirit of Sal. Ammoniac, he opened his eyes.

The mob, apprehenſive of the body being taken from them, placed it on a large board, and, ſupporting the head and ſhoulders, carried it in that manner to a village called *Glaſheen*, about a mile and an half from the gallows. Here *Redmond* was placed in a ſitting poſture on ſome hay in a ſtable, and with great difficulty ſwallowed ſome warm brandy and water. He groaned grievouſly, and ſeemed to feel great pain, which was imagined to ariſe from the friction he had undergone, as his legs and arms were in ſome places excoriated. Mr. G. then left him to the care of his friends: in the night his ſleep was accompanied with frequent groans and ſtartings. The next morning he was able to ſwallow ſome milk and brandy tolerably well; at that time he ſeemed inſenſible, and could not ſpeak, but before night he in broken accents complained of a ſoreneſs over the whole body, and after a ſound ſleep the ſecond day from his execution, regained ſufficient health and ſpirits to walk eight miles up the country to elude the ſearch of the officers of juſtice.

This man afterwards retired to the county of Clare, and was ſeen by ſeveral perſons within theſe two years, apparently in good health.

The foregoing Abſtracts cannot more properly be concluded, than with the following reflection, taken from the Gentleman's Magazine.

" It is much to be expected, from the
" happy effects that have been experienced
" in neighbouring nations, that a Society
" founded on the ſame humane principle
" ſhould be inſtituted in England, where
" charitable eſtabliſhments of almoſt every
" kind ſo plentifully abound."

" Were the methods by which perſons,
" but apparently dead, may be reſtored to
" life, properly reduced to practice and
" made known, there is no doubt but that
" many who muſt otherwiſe inevitably
" periſh for want of the neceſſary aſſiſt-
" ance would live to bleſs their benefactors."

FINIS.

The Caſe of the perſon who in a fit of Deſpair hanged himſelf, mentioned page 131.

A Young Man deeply in love, and become deſperate by the infidelity of his miſtreſs, attempted to put an end to his miſery by hanging himſelf, which he did in his own apartment. He locked the door, got upon a chair, from which he threw himſelf, the better to effect his purpoſe: the chair was overturned, and the noiſe of it gave ſome alarm to his mother in a room below: ſhe, not ſuſpecting his deſign, called to him to know what had happened, and for a time was not uneaſy at getting no anſwer; but a dead ſilence ſucceeding, ſhe called again, and then obtaining no anſwer, ſhe ran up to his door, which ſhe found ſhut; ſhe knocked at it, and hearing nothing ſtir within, ſhe exerted her ſtrength, and forced it open; when with extreme horror ſhe beheld her ſon hanging lifeleſs. A knife, which happened to be at hand, ſerved to cut him down: ſhe received his body upon her ſhoulders, and from thence ſlid it on the bed, where ſhe looſened his dreſs, and chafed him with ſome ſpiritous liquor. As ſhe was thus buſy, a friend came in, who, ſeeing what had happened, ran and fetched Mr. *Janin*. Upon his arrival he found the body in the ordinary condition of one hanged and dead: he immediately ordered frictions with warm cloths and brandy; the patient was undreſſed, laid upon his ſide, and ſeveral perſons were employed in rubbing him all over, whilſt others got aſhes, and heated them in kettles, and alſo bricks to be applied to the feet. Tobacco-ſmoke was injected into his inteſtines, and up his noſtrils. A Volatile Spirit was held to his noſe, and a clyſter of an infuſion of Tobacco was adminiſtered. An attempt was made to blow air down the wind-pipe, holding the noſe cloſe, but with little ſucceſs, becauſe the tongue was ſwollen, and hung out of the mouth. In a quarter of an hour the aſhes were hot, and he was buried in them; in thirty-five minutes more his body recovered heat; the temporal arteries began to beat, his face became livid, his tongue leſſened, and he began to breathe. At this period he was firſt bled at the right arm, and in half an hour after it at the left: he then recovered his ſenſes, and began to ſpeak imperfectly; but a violent reaching ſucceeding, the organs of ſpeech were ſoon freed, and he was relieved of a pain in his head, which he greatly complained of. He was kept three hours in the aſhes, perſpired much, and made but little water. Some Alicant wine was at firſt given him as a cordial; but when the circulation became briſk, and the pulſe beat high, he was refreſhed with broths, which were continued to him during three days. A contuſion from the nooſe, which had preſſed upon his neck, was diſpelled by a fomentation with Camphorated Spirit of Wine. When by all theſe means he was in a good meaſure recovered, he told the cauſe of his deſpair, and appeared penitent for the raſh attempt upon his life. His health and ſtrength returned afterwards by degrees, and he for ſome time was troubled with laſſitudes, a pain in his head, and a tingling in his ears; but theſe were got the better of by repeated purges, and a proper regimen.

OBSERVATIONS
ON
ANIMAL LIFE,
AND
APPARENT DEATH,
FROM ACCIDENTAL SUSPENSION OF THE
FUNCTION OF THE LUNGS,
WITH
REMARKS
ON THE
BRUNONIAN SYSTEM of MEDICINE.

DEDICATED BY PERMISSION TO
HIS GRACE THE DUKE OF MONTAGU.

By JOHN FRANKS,
CHARLES-STREET, WESTMINSTER,
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M.DCC.XC.

TO THE MOST NOBLE,

His Grace, GEORGE, Duke of MONTAGU,

MARQUIS OF MONTHERMER,

LORD MONTAGU OF BOUGHTON,

MASTER OF THE HORSE TO THE KING,

Knight of the Moſt Noble Order of the Garter,

FELLOW of the ROYAL SOCIETY, &c. &c.

THESE OBSERVATIONS AND REMARKS,

ARE, (BY PERMISSION OF HIS GRACE,)

WITH THE GREATEST RESPECT AND GRATITUDE,

HUMBLY INSCRIBED,

BY HIS GRACE'S,

MOST OBEDIENT,

AND MOST OBLIGED SERVANT,

THE AUTHOR.

ADVERTISEMENT.

THESE Obſervations and Remarks, are not executed, equal to the wiſhes of the Author, but the nature of his profeſſional concerns, rendered it impoſſible for him to preſent them to the public in a better form; to their tribunal he chearfully ſubmits them; he conſiders the undertaking as an attempt to diſcharge that duty he owes to the community, and in the diſcharge of that duty, he has a juſt claim to their candor; he had no deſire of intruding any performance of his upon the world, but rather wiſhed, that the ſubject of theſe Obſervations and Remarks, might be preſented to the public, by thoſe who are far more adequate to the execution of them. However, as that has not been done, he was determined to loſe no time in bringing forward a matter, which he conceives to be of great national import. As the inveſtigation of medical truth is his only object, whether theſe Obſervations, &c. meet with a refutation or confirmation, he cannot fail to receive gratification from the labour of others; and he is inclined to hope, that this exertion, will ſtimulate men of great abilities, to ſtand up in the defence of a doctrine they are inclined to favour, whenever that becomes neceſſary; in the interim, he ſhould eſteem himſelf highly honoured by the communications of any gentleman, on the ſubject.

Charles-Street, Weſtminſter, May 25, 1790.

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ERRATA.

Page 7. line 8 paper, *read* work.
32. — 10 of cauſes, *read* cauſes of
35. — 3 from the bottom, debiliating, *read* debilitating
39. — 5 alteration, *read* alterations
40. — 2 read, *read* and eaſy
50. — 12 effected, *read* affected
54. — 13 any, *read* ſufficient
59. — 4 from the bottom, after the word ceaſes, there ſhould have been a colon :
— 6 from the bottom, dependence, *read* dependance.

INTRODUCTION.

WHEN I reflect, that I am about to commit theſe pages, containing a few crude obſervations, into the hands of men, whoſe names the world revere, the mind experiences a painful ſenſation.

But when I declare, that the only motive, which influences me to convey theſe obſervations to the world, is this, " that TRUTH may be diſcovered, and ERROR detected, I have reaſon to hope, that the motive will plead in my defence, ſhould it not do ſo, am at a loſs for an apology.

TRUTH has too often been defeated, and ERROR too often triumphed, but a particular inſtance of ſuch an occurrence (and to which I ſhall take the liberty of alluding) preſented itſelf at the *Lyceum Medicum Londinenſe*, in the courſe of laſt winter.

As a member of that ſociety, I cannot avoid, upon this occaſion, acknowledging that I have derived much uſeful medical information, from having the honour of being a member thereof, and will take this opportunity of returning thanks for the ſame, for it muſt not be ſuppoſed, that it is my intention, by this publication, either directly or indirectly, to convey a cenſure upon any of the members of that ſociety, if ſuch an opinion is entertained, it will be doing me injuſtice.

I have no reaſon to ſuppoſe, that the ſociety alluded to, have a wiſh to conceal any thing that leads to the advancement of knowledge in the different branches of the profeſſion, as that is the only object they have in view, and which is very conſpicuouſly obtained. I have not the moſt diſtant idea, that there is any impropriety in ſubmiting to the public; a matter which has engaged the attention of the ſociety, provided the ſubject is of ſufficient importance for the public to be informed of, and whether the preſent ſubject is of ſufficient importance, they will have an opportunity of determining.

It was with much regret, that I ſaw ſome of the members of the *Lyceum*, men of great reſpectability. Men, for whoſe profeſſional abilities I feel the greateſt reſpect, ſet their faces againſt a paper, which I conceive to be of greater import, than any that has ever been ſubmited for their conſideration, at leaſt during the time, that I have had the honour of being a member, the paper was entitled "*A haſty Sketch of the Brunonian Doctrine.*"

That Dr. Brown's ſyſtem of medicine, was conſidered as a ſubject of great importance, was demonſtrated by the unuſual number of viſitors, anxious to hear the evidence of its TRUTH, or of its FALLACY. While the life, and health of the community is conſidered of value by the practitioners in medicine, ſo long will medical men feel an anxiety, and a wiſh to be relieved from that ſtate of ſuſpence, which different Doctrines have created in their minds.

I felt that wiſh very ſenſibly, and was never more happy, than when I heard ſuch a ſubject was to be preſented for diſcuſſion, I had read Dr. Brown's "*Elements of Medicine*," repeatedly and attentively, and at a time of life, that I thought I ſhould be able to reſiſt the poiſon of a falſe theory, my mind being fortified with inſtructions received from a very celebrated profeſſor of the theory and practice of medicine, in this metropolis, and by whoſe inſtructions, had hitherto endeavoured to regulate my practice.

Notwithſtanding theſe advantages, there appeared to me, ſo much TRUTH, in Dr. Brown's work, that I knew not how to reject it, ſo far as I then comprehended it TRUTH appeared, it was impoſſible to act otherwiſe, than to give credit, or at leaſt ſuſpend judgement on thoſe parts that then appeared obſcure, until ſuch time as it had undergone a fair and candid inveſtigation.

When the paper, entitled, "*A haſty Sketch of the Brunonian Doctrine*," came before the members of the *Lyceum Medicum Londinenſe*, a very favourable occaſion preſented. But in what manner was the buſineſs conducted? to ſay that the debate was conducted improperly, would be conveying a cenſure perhaps on thoſe gentlemen, who preſided, unmerited, and which is far from being my intention.

The gentlemen that oppoſed this paper, confident of the fallacy (as they thought) of the reaſoning it contained, without having patience to wait, and hear what evidence the author, or the advocates for the Doctrine, had to produce in its defence, *abſolutely* *condemned it, and paſſed ſentence before* TRIAL, *prejudicing the minds of a* JURY, *compoſed of one-hundred medical men; againſt the doctrine, in proportion to the degree of confidence, they individually placed in the opinion of theſe their* JUDGES.

I went to the Lyceum, expecting the ſubject would be fairly taken into conſideration, and that every member, or viſitor, would have an opportunity afforded him, to offer his ſentiments on a matter of ſuch magnitude; but in this expectation, I was diſappointed, it was impoſſible for many of the members to deliver their ſentiments, the object in view was not attainable, for I was nearly as much in ſuſpence, with regard to forming an opinion of the doctrine generally, after the paper was gone through, as before it was preſented for diſcuſſion, the debate was entirely engroſed between the author, on one hand, and a few members who oppoſed him on the other; HEAT, CLAMOR, and ASSERTION, *was ſubſtituted, for cool, and deliberate reaſoning.* And unleſs we are to admit, HEAT, CLAMOR, and ASSERTION, as full proof of the abſurdity of the Brunonian doctrine, I declare ſolemnly I heard no evidence in ſupport of its being ſo. Dr. Brown has made but few diſtinctions, thoſe diſtinctions are of the firſt importance, but they were not attended to by the gentlemen in their oppoſition to the paper. LOCAL *diſeaſes were confounded with* UNIVERSAL *diſeaſes,* *and* LOCAL *with* UNIVERSAL *ſtimuli, and theſe local diſeaſes, and ſtimuli, were produced as proofs of the inconſiſtency of the doctrine.*

We have no right to attribute an unfavourable motive to the actions of men, when they declare the motive, from whence thoſe actions ſpring, unleſs we had proof ſufficient to warrant us ſo to do.

When gentlemen in their oppoſition to a paper, declare, *that they have no motive for oppoſing it, than that the matter contained therein, appears of a dangerous tendency to them, that they think it their duty as members of the ſociety, to ſtand up and oppoſe it, leſt young men be led into an error.* Every man muſt give them credit for the motive, and applaud their conduct.

But it is the prejudging of any matter, which I contend is improper, and in the caſe alluded to, might have a tendency to make ſome of the younger members take a matter of importance upon truſt, upon the aſſertion of others, rather than look into a book, and exerciſe thoſe faculties Heaven has endowed them with.

The BRUNONIAN ſyſtem of medicine is of too much importance not only to the Faculty, but to mankind in general, to be concealed from the public, on a bookſellers' ſhelf, or to be diſcuſſed in a corner, and that diſcuſſion confined to a few in number, Dr. Brown's, "Elements of Medicine," conſiſt of only two volumes, but they contain more intereſting matter, than is to be found in moſt of the works of that nature, that occupy three times the quantity of paper.

Dr. Brown's work either contain *truths* of the greateſt importance to the life and health of mankind, or it contains *errors* of equal importance; as an individual, am of opinion it contains *truths*, and of ſuch magnitude that they would deſerve the attention of the *legiſlature*, if the *legiſlature* were competent to decide on *ſyſtems of medicine*. *Dr. Brown's* work is nevertheleſs an object of national concern.

I have declared, that my only motive for intruding theſe obſervations on the public is, "*that truth may be diſcovered, and error detected.*" It is one of my greateſt wiſhes, and muſt be the wiſh of every man, that thoſe objections which have been made to the Brunonian ſyſtem of medicine, by men of eminence in their profeſſion, ſhould be publicly made. If it was their duty to object to the doctrine in a ſociety, to prevent young men from being precipitated into *error*, it is equally their duty to mankind, to make thoſe objections in ſuch way, that cognizance may be taken of them; nay, it is not only a duty which thoſe gentlemen owe to mankind, but it is a duty which they owe to themſelves,

ſelves, and if their objections to the doctrine do not appear before the public tribunal, only one conſtruction can be placed on their ſilence, *viz.* " that the objections cannot be defended.

As the objections, which have been made to the Brunonian ſyſtem of medicine, are not recorded, except in the minds of the members, it would be I conceive extremely improper to ſtate, and endeavour to give them a complete refutation at this time, by ſuch conduct I ſhould expoſe myſelf to the imputation of a miſrepreſentation of facts, againſt which charge (if made) ſhould have no defence, except in the memory of the members; and I do not conſider that as a ſufficient ſecurity, or have I the leaſt wiſh to involve any gentleman in a diſpute about words.

It has been ſaid, Dr. Brown acted very different from other ſyſtematic writers, for that he formed a *theory*, and afterwards by his ingenuity compeled *practice* to coincide with it.

Very ingenious indeed, muſt that man be that could do this, and afford at the ſame time no opportunity for his opponents to ſhew wherein his *practice* was inconſiſtent with his *theory*, and yet that *practice* good, or to ſhew us *diſeaſes*, to which his *theory* would not apply.

It ought not to be concealed, that this inconſiſtency, was attempted to be proved by the oppoſers of the doctrine, and they apparently ſucceeded in a ſingle inſtance for the moment, as the objection could not be done away, by any of the members or viſitors in the ſociety. As this caſe was eſteemed a very conſiderable point gained, and which it is impoſſible for the ſociety to avoid recollecting. I ſhall ſtate it, and endeavour to ſhew, that it does not prove, that which it was ſuppoſed to do, *viz.* "the abſurdity of the doctrine."

ENTERITIS.

The caſe of *Enteritis*, was ſelected as a proof of the defect of the *Brunonian theory*, when applied to *practice*. It was ſaid, "Here is

" an internal inflammatory diſeaſe,
" according to that *theory* depend-
" ing upon increaſed *Excitement*,
" the ſafety of the patient, conſe-
" quently requires that the *Excite-*
" *ment* ſhould be diminiſhed. But
" how is a practitioner, who is not
" acquainted with any other *theory*
" than that of *Dr. Brown*, to
" know that the diſeaſe is inflam-
" matory, or to diſtinguiſh it from
" that occaſioned by the poiſon of
" lead, *the pulſe not being indicative*
" *of exceſſive Excitement?*"

Now I think it will appear, that *Enteritis* does not militate againſt the doctrine; if it did, it would be a caſe where the pulſe deceived us. The pulſe perhaps never deceives us, if with it, we pay attention to the other ſymptoms; if there is an inflammatory diſeaſe brought on by *exceſſive Excitement*, the pulſe will always point it out to us, as truly as it does in *Peripneumony*.

In *Peripneumony*, the inflammation of the Lungs is not the original affection, it depends on the inflammatory, or what Dr. Brown calls *ſthenic diatheſis* as a cauſe, and forms an *univerſal diſeaſe*, the indication of cure, is evidently to diminiſh the diatheſis.

ENTERITIS, on the other hand, is an organic affection, *ſthenic diatheſis* is not neceſſary for its production, *ſthenic diatheſis* undoubtedly may often be preſent, when that is the caſe, it alters the mode of treatment. But that *Enteritis* does not depend on *ſthenic diatheſis* is plain, becauſe the diſeaſe is often ſeen when the *oppoſite diatheſis* is preſent, which ought never to happen if it depended on *ſthenic diatheſis*, diatheſis then is accidental.

In *Enteritis*, the part is primarily affected, and in conſequence of the exquiſite ſenſibility of it, the whole nervous and vaſcular ſyſtems are diſturbed, and many ſymptoms ariſe, ſimilar to thoſe which are peculiar to *univerſal diſeaſes*.

Dr. Brown has divided diſeaſes into *univerſal* and *local*, as well as into *ſthenic* and *aſthenic*, the Doctor ſays, paragraph 5th, "diſeaſes are "either extended over the whole "body, or they are confined to a "part, the former merit the appellation of univerſal, the latter "that of local; the former are "always univerſal, from their firſt "commencement; the latter in "their courſe, and that but ſeldom; "the former are always, the latter "never preceded by prediſpoſition; the originality of the former proceeds from an affection "of the principle of life, of the "latter from local injury; the cure "of univerſal diſeaſes is applied to "the whole body, the cure of local "to the injured part."

ENTERITIS, in Dr. Brown's work, has a place in the ſecond diviſion of local diſeaſes, Vol. II. chap. iii. page 323, the cure of which the Doctor ſays, is preciſely the ſame, as in the *Gaſtritis:* treating of *Gaſtritis*, the Doctor obſerves, "As this is a local diſeaſe, and does not, like the general ones, depend upon the increaſe or diminution of excitement, conſequently the indication, ſuited to the latter, to wit, to diminiſh increaſed, or increaſe diminiſhed excitement over the whole body, will not apply; on the contrary, unleſs a general diſeaſe happens to be combined with it, local remedies are alone to be depended on."

By local remedies, in this caſe, Dr. Brown certainly wiſhes to be underſtood, ſuch remedies as are employed, not with the intention of taking down Excitement, but with the intention of removing thoſe hurtful powers, that by contact have injured that very ſenſible part the inteſtines; upon this principle we throw in remedies both by the mouth, and per anum; bleeding, though a remedy of the firſt importance in *univerſal ſthenic diſeaſes*, has no place here, in this caſe general debility is induced, as is demonſtrated by the feeble and quick contractions of the Heart and Arteries.

A man may bleed his patient as much as he pleaſes in Enteritis, yet if he does not procure evacuation per anum, all his bleeding will be ineffectual; if he is ſucceſsful in procuring a copious diſcharge from the inteſtinal canal, his patient will do well, and if bleeding has been employed, will venture to ſay it has had no ſhare in the cure.

Men by mixing with good company, often acquire a more favourable character than they deſerve; in like manner many of the articles in the *materia medica*, by being employed in particular caſes, in conjunction with a number of remedies, if the event is favourable, they cannot fail to gain a conſiderable ſhare of reputation.

To me there is not any fact more clear than this, where inflammatory diatheſis exiſts, it will be demonſtrated by the ſtate of contraction of the Heart and Arteries, and where it does not exiſt, (there may be a few exceptions perhaps) bleeding from the ſyſtem is not neceſſary as a remedy, but may in many inſtances be highly injurious.

Enteritis, though ſituated in a very different part of the body, and different in other reſpects, is nevertheleſs as much a *local inflammation as ophthalmia*, in ophthalmia we perform a cure by topical applications, topical bleedings, and removing the ſtimulus of light; It is well known that if we take half an ounce, or an ounce of Blood from the parts near the eye, by applying leeches, we benefit our patient more, than if we took a pound from the ſyſtem. And it is with great propriety, in the caſe of

Enteritis that we take Blood, by means of cupping glaſſes, and ſcarifications from the parts containing the abdominal viſcera, as alſo by endeavouring to excite inflammation in this external part, at the ſame time no great dependance is to be placed, on topical applications in the caſe of *Enteritis.*

Baron Haller, from ſome Experiments that he made, found the *inteſtines*, more ſenſible, than moſt parts of the body, more than the *Stomach*, and equal in ſenſibility to the *Brain*, the more ſenſible a part is, or the more abundant the excitability in a part, the leſs ſtimulus can be borne, without injury being done to that part. This being a fact, we may readily ſee how the inteſtines become inflamed, when we reflect upon the ſtimulating powers, with which they are frequently filled, and which are from negligence (in women more particularly) very often long retained.

I have known many inſtances, where this neglect has excited inflammation in the courſe of the inteſtinal canal, and every medical man muſt have ſeen many inſtances of the ſame occurrence; one lady in particular I was acquainted with, this lady, from the peculiar pleaſure ſhe experienced in cultivating the faculties of the mind, paid ſuch unremiting attention to the ſcience of aſtronomy, that the care of the body became a ſecondary conſideration, ſhe neglected to apply proper exciting powers to the body, and ſhe alſo neglected to remove thoſe which were very likely, ſome time or other, to prove hurtful.

This lady was going one ſummer evening, to a friends houſe but was prevented by being inſtantly ſeized with a violent pain in the bowels, which came on without the leaſt previous indiſpoſition, her face was always ſo extremely pale, and ſhe was of ſo delicate a habit, that a ſpectator would immediately ſee, that the Blood did not contain the proper quantity of craſſamentum; upon enquiry it appeared, this lady had not had any evacuation *per anum*, for ſeven or eight days, ſhe was inſtantly let Blood, I ſaw the danger, and recommended the calling in a phyſician, ſhe was let Blood a ſecond time, by the phyſician's direction; every means likely to afford relief was preſcribed, no evacuation from the inteſtines could be obtained, death took place before twelve o'clock the next day.

That there will remain probably a difference of opinion, with regard to the medical treatment of *Enteritis*, I have little doubt, have no ſolicitude about the matter, what I have ſaid on the ſubject, has been ſufficient to prove, that *Dr. Brown's Theory of Medicine, will not deceive us in practice, in ſo far as Enteritis is concerned at leaſt;* and I think that thoſe gentlemen, who do me the honour of reading theſe obſervations, will be of opinion with me in this, “ that there is at this time, no neceſſity of defending that author further, no charge being made in ſuch way that cognizance can be taken of it.”

But, though no neceſſity exiſts, for the advocates of Dr. Brown, (and advocates he has many in number, and great in reſpectability, who are waiting to take the field in his defence, whenever his opponents afford them any thing to attack) to defend him further at this time, I ſhall not think I have diſcharged my duty to mankind, or done juſtice to an injured author, who is not now in the way to defend himſelf, if I omit upon this occaſion, to take notice of a part of the practice he recommends, which practice, if followed, would in my opinion be the means of preſerving the life of many a valuable member of ſociety, experiencing a diſeaſe which prematurely puts a period to his exiſtence. *Prematurely*, becauſe it is in the flower of youth that the greater number of perſons are carried off by this diſeaſe. *The Diſeaſe to which I allude is*

HECTIC FEVER.

It is not of any conſequence, whether we conſider Hectic Fever as an univerſal diſeaſe, or a ſymptomatic affection, becauſe the indication of cure is the ſame, if it is an univerſal diſeaſe, it belongs to the aſthenic claſs; if ſymptomatic, the local affection that induces it has a cauſe, and that cauſe is debility. In treating of Hectic Fever here, I mean to confine myſelf to it, as occurring where no local affection can be traced, or as induced by morbid affection of the Meſenteric Glands, this ſingle diſeaſe ſo induced, I will take upon me to aver, and the experience of medical men; nay, the experience of mankind in general, make them competent to form an opinion here, will ſupport me in the aſſertion, carries off a very conſiderable number of perſons.

The young of both ſexes, patients who have not lived luxuriouſly, are not objects of indirect debility, but of the direct; the aſthenic diatheſis prevails, which prediſpoſes to diſeaſes of that claſs, when thoſe diſeaſes make their appearance, how are they too often treated in this metropolis? ſtrange to ſay, but true it is, they are treated under the influence of a falſe theory, by the debilitating plan of cure.

If a diſeaſe owes its origin to a debilitating cauſe, is a debilitating mode of treatment likely to cure it?

No, but a well directed ſtimulating plan will.

Can Hectic Fever, which is ſo frequently found to occur in the younger part of ſociety, in perſons who are of a weak delicate habit, *lax fibre*, and who have not made too free with ſtimulants, be aſcribed to exceſſive excitement, occaſioning ſthenic diatheſis? No.

If Hectic Fever, in that point of view, in which I have taken it, cannot be attributed to ſthenic diatheſis, are we juſtifiable in taking Blood from thoſe patients committed to our care, week after week, ſo long as we perceive on the Blood, a ſurface of coagulable Lymph? No.

Is Lymph on the ſurface of the Blood, an infallible proof of the exiſtence of inflammation, ariſing from ſthenic diatheſis? No, it is an equivocal one.

Is it not a matter of the firſt importance in the practice of medicine, to diſtinguiſh diſeaſes that actually ariſe from *exceſſive Excitement*, from thoſe which have only the ſemblance of *exceſſive Excitement?* moſt certainly.

When patients of the above deſcription, viz. weak delicate habit, *lax fibre*, *&c.* apply to us, and complain of pain in a part, loſs of appetite, great thirſt, &c. and we find the pulſe quick, do we not bleed them? we find Lymph on the ſurface, and we repeat the bleeding, find the ſame appearance, and we go on, *Bleeding*, *Purging*, *Sweating*, *Vomiting*, *Starving*, tell them that a glaſs of wine, or a morſel of animal food is as bad as poiſon, that if they do not totally abſtain, from thoſe articles of food and drink, and all other of the ſame quality, their medicines will be counteracted in their effect.

We perſevere in this mode of treatment, month after month, find debility encreaſe upon our hands, the contractions of the Heart and Arteries, become weaker, and the celerity by no means checked; we put on a countenance full of pity, tell the diſconſolate father or mother, that medicine will be of no ſervice to their child, we can do no more for them, they cannot recover, and we reſign them to their fate as incurable.

That thoſe unfortunate perſons, victims of falſe theory, are abſolutely incurable, when we take our leave

of

of them, after a long continuance in ſuch a debilitating mode of treatment, as has been preſcribed for them, is perhaps too true, it is then too late to attempt any thing in their favour.

It is far from my intention, and I hope it will not be ſuppoſed, that theſe remarks are directed againſt any particular gentleman concerned in medicine, the error is, a common error, we are as a collective body, more or leſs involved in it, this conſideration will ſecure me from ſuch an unpleaſant imputation.

Hectic Fever, and its concomitant ſymptoms, make too quick a progreſs in their debilitating effect, to make it neceſſary for us to lend them any aſſiſtance, but we certainly do lend aſſiſtance to thoſe debilitating ſymptoms, if we *Bleed*, *Purge*, *Vomit*, and *Starve*, for we find debility daily increaſe upon our hands, and is this to be wondered at? the patient is more and more emaciated, his friends, and every one that ſee him, take notice of this, our profeſſional characters are perfectly ſecure, the body waſtes, the diſeaſe is called a Decline, a Conſumption; if a diſeaſe is called a Decline, or a Conſumption, mankind know not how to diſcriminate, it is eſteemed incurable by them, and the performing a cure in theſe caſes conſequently not expected of us.

It certainly does appear very unaccountable, that when we ſee no benefit obtained, from the debilitating plan of cure, we ſhould continue inflexibly to perſevere in it. The reaſon I apprehend is this, we conſider the *Fever* as the cauſe of the decay, therefore we direct our efforts, to the removing of the *Fever*, and by ſo doing impede the decay; but are we not yet ſatisfied, that the Fever cannot be removed by *Bleeding*, *Purging*, *Vomiting, and Starving*, thoſe are the remedies proper for diſeaſes brought on by *exceſſive Excitement*, and not for thoſe that put on the fallacious appearance of ſthenic diſeaſes, they can have no place in the indication of cure in theſe caſes.

We conſider this continued Fever, as the cauſe of the decay, and as giving riſe to the other ſymptoms. If we extend our view a little further, will it not appear to us, that this Fever has a cauſe, and that its cauſe is *Debility?* it will appear ſo, and I muſt beg leave to repeat the queſtion, "*If a diſeaſe owes its origin to a debilitating cauſe, is a debilitating mode of treatment likely to cure it?*

But, by counteracting debility, by giving *Tonics*, and *Stimulants*, and preſcribing a ſtimulating regimen, our patients may, in many caſes of this kind, be recovered, perhaps in moſt of them, we do not include in this account, thoſe caſes where an organ of great importance is become ſo diſeaſed, as to have its function very much impaired, or deſtroyed; for inſtance, *Liver complaints*, which are found ſo frequently to occur in hot climates. *Phthiſis Pulmonalis*, we cannot include, the ſeat of that diſeaſe, is in an organ of the firſt importance, this organ is very peculiarly circumſtanced, the nature of thoſe circumſtances, will render the diſeaſe in moſt caſes incurable, let the mode of treatment be ever ſo judiciouſly applyed; but it is found in practice, that there are a great number of local affections that take place within the abdominal cavity, (particularly in perſons of a ſcrofulous habit) of leſſer importance, which induce Hectic Fever, and which certainly are curable, but not by the debilitating mode of treatment.

There are phyſicians in this town, who have been very ſucceſsful in curing diſeaſes of this deſcription, even when their parents have been in *Debilitys* laſt ſtage, by deſiring them to drink *Porter*, *Red-Port*, eat *Animal Food*, and take ſuch medicines, as coincide with the indication of cure, *viz*. to ſtrengthen the conſtitution.

And I am very happy in having this opportunity of teſtifying their ſucceſs, more eſpecially as it may induce others to adopt the *Stimulating*, and reject the *Debilitating* plan, and who might not be over willing to take any thing from Dr. BROWN, until the *irreſiſtable truth* *of his doctrine was diſcovered and univerſally acknowledged.*

I have been in the way of ſeeing a conſiderable ſhare of medical practice, in the courſe of twenty years have obſerved Hectic Fever to be a frequent diſeaſe, know that the *debilitating plan of cure* has been prevalent; and alſo know that when that plan has been followed, the termination of the diſeaſe has been generally fatal; and that in the few inſtances where the *Stimulating plan* has been practiſed, the patients have done well.

Two of my very near relations fell into Hectic Fever, they were both in the prime of life, not ſubjects of indirect debility, but of direct; they had no pulmonary affection, the Fever in both originated in a morbid ſtate of ſome of the *Abdominal Viſcera*, moſt probably the *Meſenteric Glands*; Men of the firſt eminence in their profeſſion was conſulted, the *debilitating plan of cure* was recommended, viz. *Bleeding*, *Purging*, and *Starving*, theſe caſes terminated unfavourably.

A third relative had nearly ſhared the ſame fate, from the like ſymptoms of diſeaſe, and mode of treatment, ſhe was one of thoſe that I have ſeen in *Debilitys laſt ſtage*, a perfect ſkeleton, it was deemed impoſſible for her to live, nor indeed could ſhe have ſurvived many days, if a ſtand had not been made, and the formidable ſymptoms of diſeaſe, not powerfully oppoſed. But it was at this period of the diſeaſe, that a very powerful ſtand was made, after experiencing a gradual emaciation for many months, *profuſe night ſweats*, and now *Diarrhoea*, equally profuſe, great thirſt, &c. ſhe was preſcribed a *ſtimulating regimen*, and medicines of the *Tonic and Stimulant kind*, the ſymptoms immediately became leſs violent, and by perſevering in this courſe ſhe gradually recovered, and has enjoyed better health ſince, than at any time previous to the diſeaſe.

That Dr. BROWN's "*Elements of Medicine*," ſhould meet with oppoſition is not wonderful, every new and great diſcovery always ſhared the ſame fate, mankind has ever been found to ſpurn, at that which was intended for their benefit;

INOCULATION, for example, was very much oppoſed, but it has made its way. Objections to *truth* cannot live. If Dr. BROWN's ſyſtem of medicine has great merit, that merit cannot be concealed, it will make head againſt all oppoſition; but this ſilent conduct in medical men, would be I conceive, trifling with the lives of their fellow creatures, becauſe it is not a ſpeculative matter, we are juſt as competent to decide on the buſineſs now, as at any future time. And have we a ſyſtem of medicine ſo perfect, as to make the ſearch after improvement unprofitable? are we to poſſeſs ſuch a veneration for the opinions of thoſe great men who lived before our time, and did ſo much for the art, as to deem it

Arrogance in a contemporary, to make an attempt at improvement? if we will not allow Dr. Brown's work to contain uſeful information, are we to condemn him for publiſhing a work, (the truth of which he appears to have been ſo thoroughly convinced) and for chalenging a fair and manly inquiry? heaven forbid.

Dr. Brown's "*Elements of medicine*," is a work of great national import, well deſerves public inveſtigation, when the enquiry is begun, not in a ſociety appropriated to debate, and where a few gentlemen only can deliver their ſentiments, and thoſe ſtand up a dozen times, if they pleaſe, to the hindrance of others; but by publicly ſtating the objections, thoſe objections will then be done away, or remain in force; the matter will be brought to a *criſis*, and there is not a medical gentleman in the King's dominions, that would not be anxious to know the reſult, to know whether Dr. Brown's ſyſtem of medicine contain *abſurdities*, or *important truths*, and according to that knowledge endeavour to regulate his practice.

The following pages contain obſervations on animal life, and apparent death, which ſerve to illuſtrate Dr. BROWN's fundamental principle, the ſubjects are intimately connected, and we cannot avoid blending them in this work. When we are perfectly acquainted with the real nature of animal life, many phœnomena may be explained; and we ſhall proceed ſcientifically to work on that living machine, which is ſo frequently out of repair, by being brought out of *darkneſs* into divine *light*.

The Humane Society, wiſhing to inſtitute an inquiry into the ſubject of apparent death, from ſuſpenſion of reſpiration; tender very honourable rewards to the authors of approved diſſertations on that ſubject. The ſpirit of emulation has been excited, and much light diffuſed, particularly by Dr. Goodwin and Mr. Kite, whoſe eſſays obtained the ſocieties prize medals.

Dr. Goodwin and Mr. Kite, do not agree as to the internal immediate cauſe of the appearances which take place after ſubmerſion, &c. conſequently cannot agree as to the indication of recovery, Dr. Goodwin's cauſe admit of but one indication; Mr. Kite's require two, until ſufficient evidence is produced to convince me that my ideas of animal life are erroneous, I muſt be obliged to remain of Dr. Goodwin's opinion as to the internal immediate cauſe of death after ſubmerſion, &c. more eſpecially, as Dr. GOODWIN's experiments confirm my obſervations on *Animal Life*, as does Dr. CRAWFORD's on *Animal Heat*, Mr. HEWSON's on the *Blood*, and Dr. PRIESTLEY's on *Air*, and I know not of any experiments that militate againſt them.

They will be found to ſupport Dr. Goodwin's opinion, as to the immediate cauſe of death after ſubmerſion; and they alſo afford additional proof of the truth of the fundamental principle on which the *Brunonian* ſyſtem of medicine is founded, viz. "*that Animal Life is a forced ſtate of exiſtence.*

Charles-Street, Weſtminſter,
April the 19*th*, 1790.

OBSERVATIONS, &c.

WHEN we conſider an animal body as a piece of mechaniſm beautifully conſtructed upon mechanical principles, that it is no longer alive, than while it enjoys motion, that motion is communicated to a part by an external agent, and from that part to the whole machine; theſe conſiderations will teach men, that which is the moſt effectual means, and on which the greateſt dependance is to be placed, for the recovery of perſons apparently dead after ſubmerſion in water, hanging, &c.

Every man by making uſe of thoſe faculties heaven has endowed him with, will immediately perceive, that he is going the moſt ſucceſsful way to work in accidents of this kind, by applying that power, which, by a direct agency, will cauſe the Heart to renew its contractions, ſuch a power he will find, is atmoſpheric air, atmoſpheric air having been interrupted in the communication which is conſtantly kept up with the blood paſſing through the Lungs, being the immediate cauſe of all the appearances, is the power, we ſhould loſe no time in applying, for when properly applied it will produce its former effect, provided reſpiration has not been too long ſuſpended, and the principle of life by that means totally deſtroyed.

Accidents to which theſe obſervations allude, will continually happen in many parts of this iſland, at a conſiderable diſtance from the reſidence of profeſſional men, conſequently their aſſiſtance will very often arrive too late, as in the Fens of Lincolnſhire, and other places, where there is much water.

Accidents of this kind are ſhocking to humanity, but there are ſeldom wanting perſons in theſe ſituations, not poſſeſſed of that degree of courage, to exert every means in their power for the recovery of their fellow-creatures, mankind will in ſuch circumſtances, be found to poſſeſs great preſence of mind, and a conſiderable degree of fortitude, but it is the uncertainty of the means, not knowing the moſt effectual method of proceeding that diſarms them, one ſays this thing ſhould be done; a ſecond, ſuch a thing; a third this; a fourth that, all is in confuſion, all are expoſed to the operation of fear, the moſt debilitating of all the paſſions, the mind is ſuſceptible of.

But when mankind are informed of the moſt effectual methods made uſe of for recovery, and fortunately for their fellow-creatures, in theſe unhappy circumſtances, that it is in their power to apply the moſt effectual means for that purpoſe, fortitude will take poſſeſſion of the mind's empire, fear, will not find a place.

I had long ſince entertained an opinion, which was not generally received, that bleeding in caſes of apparent death, from accidental ſuſpenſion of the function of the Lungs, was very improper,

A patient of mine the latter part of the laſt year, from a deranged ſtate of the intellectual faculty, the conſequence of fever, took the opportunity when the nurſe left the room, to jump out of his bed, make faſt the door, and with a cord which he had uſed for the purpoſe of raiſing himſelf when in bed, he ſuſpended himſelf; the door was forced open, he was cut down, the number of minutes he had been in that ſituation cannot be determined, but there was not the uſual ſigns of life at that time, I was ſent for, the room was crouded, the general outcry was, bleed him; tolerably well ſatisfied in my own mind, that bleeding was not proper in theſe caſes, I was determined not to give into their opinion, tho' I might have made a feint, by making a few punctures with the lancet, ſo as to draw no blood, which would have ſatisfied them, and ſecured me in their good opinion, provided my patient could not be recovered.

But I was perfectly eaſy, on that ſcore, for I ſaw ſigns of life upon entering the room, or in leſs than a minute after; that being the caſe, I was not under any neceſſity of inflating the Lungs with air, tho' reſpiration had been ſuſpended for ſo ſhort a period, and the body not expoſed to a cold medium; there was a fire in the room, and he had many of the common articles of cloathing over his body; I could not avoid remarking the very ſenſible diminution of heat that had taken place, there appeared to me, to be not any thing more to do in this caſe, than to reſtore the natural heat, and by ſo doing accelerate the recovery; a bottle with brandy ſtood on a table, we began to rub him with it, and at firſt to rub his tongue, and drop a few drops into the mouth; preſently after we ventured upon a tea ſpoonful, found he made the gulp, and continued the uſe of it in that manner. But, the by-ſtanders having no idea of giving brandy to a dead man, or the recovery, tho' very flattering, not being brought about ſo ſoon as they expected; I was very much perplexed, to pacify and amuſe them, went home for a medicine, returned, found the friends had been to a very eminent gentleman of the profeſſion, that this gentleman had ſent word that the patient ſhould be let blood; I perſevered in my reſolution, not to bleed him; a third gentleman was ſent to, and after that a fourth; by this time the natural heat was reſtored, and the recovery far advanced, bleeding was not performed, it was rather unfortunate for me in this caſe, that the opinion of the medical gentlemen applied to, ſhould be unanimouſly againſt me with regard to bleeding; however, as the patient recovered from the accident, and likewiſe from the fever, all was well

My reaſon for adopting the opinion that bleeding was improper in caſes of ſuſpended reſpiration was this, that as all the foreign exciting powers, which are applied to an animal body, when in health, for the purpoſe of carrying on life, all act by a ſtimulating operation, more or leſs, ſo in caſes of apparent death, no methods ought to be made uſe of, except ſuch as are likely to produce that effect; now bleeding has a direct tendency to counteract the only indication of cure in theſe caſes, which will be explained in the courſe of this ~~paper.~~ work

That animal life is a forced ſtate of exiſtence, the firſt fifty-nine pages of Dr. Brown's works is intended to ſhew, they form a great body of evidence in ſupport of a fact, that neither this, or any future age of man will be able to overturn, and he finiſhes this enquiry page 59, paragraph 72, with the following emphatical words.

"From all that has hitherto been ſaid, it is a certain and demonſtrated fact, that life is a forced ſtate, that the tendency of animals every moment is to diſſolution, that they are kept from it by foreign powers, and even by theſe with difficulty, and only for a little, and then, from the neceſſity of their fate, give way to death".

The foreign powers, Dr. Brown enumerates in page 3, chap. 2, paragraph 11, " The external agents in general, are reducible to heat, diet, other matters taken into the ſtomach, the blood, the fluids ſecreted from the blood, and air.

It is not my intention in theſe obſervations, to take notice of any of theſe foreign powers, except air, as they are not immediately connected with the ſubject, air is inſeparably connected with it, and in the point of view air has been taken in, it makes very much, and ſo pointedly for Dr. Brown's fundamental principle, that animal life is a forced ſtate, that I cannot avoid applying it occaſionally, but I would of all things wiſh this circumſtance to be recollected; " that if theſe obſervations are controverted, Dr. Brown's principle will not be affected, becauſe the Doctor lays no particular ſtreſs on Air, he only conſiders it as one of the external agents".

I have heard Dr. Brown's principle diſputed, and the Diſputants have appeared to be very much diſſatisfied with the Doctor, for that he did not carry his principle further, that he did not include life in *utero*, enquire how the embryo was formed, the Doctor was extremely wiſe in not doing that which neceſſity did not require of him, and have opened a door for endleſs debate.

Was it neceſſary for Dr. Brown, in applying his principle to animal life, to extend his enquiry to the minutiæ, or firſt principles of bodies, which is above the ſphere of human comprehenſion? the Doctor ſaw, that the moment an animal made its entry into the world, its mode of living was inſtantly new, an external power was immediately applied, and the animal ſupplied with an organ, which was now to begin to exerciſe its function, and oblige that power to be ſubſervient to the grand deſign.

Shall I be pardoned for making a momentary pauſe, and endeavour to trace the wiſdom and goodneſs of the Grand Author of nature, and notice the care taken of man, his principal work?

We find the foreign exciting powers, which muſt of neceſſity be applied to the body for the purpoſe of ſupporting life, conſiſt of two kind, they are either thoſe that gratify the ſenſes, when applied, as meat, drink, heat, &c. and are applied at intervals, as occaſion requires; or, that power which ſuffers no interruption in its application, and is applied independent of the will, gives us no concern, becauſe it always ſurrounds us, as air.

Ought not we to ſee the care taken of, and the value ſet on this temporal life of man, by the Grand Architect of the univerſe; experience too plainly ſhews us how much ſome of the firſt ſet of powers are abuſed and over applied, becauſe they are pleaſing to the ſenſes, and had it have been made neceſſary, that any power ſhould be applied to the body, at the command of the will; at fixed intervals, and of equal importance with atmoſpheric air; how extremely precarious would have been the life of man, there is no ſaying what large proportion premature death under ſuch circumſtances would have borne to death, from every cauſe combined. But, thanks to the beneficent Creator, no foreign powers are neceſſary to be applied to the body, except thoſe which are to be applied occaſionally, ought to be applied with diſcretion; and that external agent, which gives no inconvenience in its application, conſtantly ſurrounds us, and is applied to the body, independent of the will as atmoſpheric air. We find creation governed by general laws; and we find that atmoſpheric air, by univerſally diffuſing a proper quantity of elementary fire, gives life to the whole animal, and vegetable kingdoms.

Life, in the more perfect animals, is by Dr. Goodwin, defined to be. "The faculty of propelling the fluids through the circulating ſyſtem".

This definition I am inclined to think, is not ſufficiently intelligible, it may convey an idea, that this faculty is inherent rather than communicated, in which ſenſe

Dr. Goodwin, as will appear in his work, does not wiſh it to be underſtood.

Thoſe that maintain an opinion, (if any there are) that an animal poſſeſſes any innate faculty by which the fluids are propelled through the circulating ſyſtem, contradict facts, and take from an important organ its only uſe.

Man differs from dead matter, in this, he is capable of being acted upon while living by external agents; this living principle, which he enjoys, and which is conſtantly acted upon for the purpoſe of carrying on life, we do not underſtand, nor is it abſolutely neceſſary for us; but as we very indifferently expreſs what we cannot define, words of various import are frequently made uſe of to expreſs the ſame thing.

From different phœnomena, we may conclude that the excitability of Dr. Brown (for that is the word I ſhall make uſe of, where the principle of vitality is meant ſhould be underſtood) is one undivided property throughout the whole body; but that it is more abundant in particular parts of the body, as in the Inteſtines, Stomach, Brain, the Heart, &c.

While life remains, a certain quantity or energy of excitability is preſent, for the only difference between apparent and poſitive death, conſiſts in the preſence or abſence of this principle.

If the excitability is not totally extinguiſhed, an animal may be prevented from experiencing poſitive death, for if our endeavours are well directed, we ſhall occaſion the Heart to renew its contractions, by cauſing the Blood to produce its accuſtomed ſtimulating effect, which ſtimulating effect it is deprived of, when the natural communication between the atmoſpheric air, and the Lungs is interrupted, as in the caſes of ſubmerſion, hanging, &c.

That the Heart will renew its contractions upon the application of its accuſtomed ſtimulus, if any excitability remains, we have good reaſon to expect, but if that does not happen ſo ſoon as we could wiſh, we ought not to give the patient up as irrecoverable, becauſe we are not acquainted perhaps with any poſitive ſign of the abſolute extinction of life after ſubmerſion.

Mr. Kite is of opinion, that the pupil being contracted, eſpecially if it has for ſome time before been obſerved to be much dilated, will in caſes of ſubmerſion, yield a pretty certain indication of death; he thinks alſo, that ſome dependance may be put on one of the pupils being more contracted than the other, as it is from this preſumable, that the influence of the Brain and Nerves is entirely annihilated, and the irritable principle utterly deſtroyed.

Death, this gentleman thinks, may alſo be infered from a proof of the poſitive extinction of heat, when it is found that no change is induced in a thermometer, introduced three or four inches into the *rectum*;

rectum; another mark on which Mr. Kite places dependance, is the proof of water in the Lungs, which he thinks may be infered from artificial reſpiration, forcing away a quantity of frothy water by the mouth.

But it will appear by Dr. Goodwin's experiments, that only a ſmall quantity of water enters the Lungs, there mixing with the pulmonary mucus, occaſions the frothy appearance deſcribed by authors; but the pulmonary mucus alone, will occaſion the frothy appearance, for I ſaw it occur in a caſe of ſtrangulation.

Mr. Kite conſiders the electrical ſhock as affording the moſt diſcriminating characteriſtic of any remains of life, as long as it produces contractions, the perſon may be ſaid to be in a recoverable ſtate; but when that effect has ceaſed, no doubt Mr. Kite thinks, can remain of the perſon being abſolutely and poſitively dead.

The principal cauſes to which the death of drowned perſons has been attributed, may, Mr. Kite thinks, be comprehended in the four following.

Firſt. That ſpecies of apoplexy, which ariſes from an over diſtenſion of the Stomach.

Secondly, The Blood being rendered unfit for performing its offices by want of the action of the air in reſpiration.

Third, Water in the Lungs.

Fourth, A contraction of the parts about the larynx, preventing the air from paſſing into or out of the Lungs, and producing death by the encloſed air, being rendered highly phlogiſticated.

Mr. Kite's opinion is, that the internal immediate cauſe of death is to be aſcribed to the induction of apoplexy, which he endeavours to ſupport by many arguments, but I muſt be obliged to differ in opinion with that gentleman, and coincide with

Dr. Goodwin, that the Blood having loſt its ſtimulating effect, in conſequence of the communication with the air being interrupted, is the immediate cauſe of death after ſubmerſion.

I ſhall proceed to give the reſult of ſome of Dr. Goodwin's very ingenious experiments, as alſo ſome concluſions drawn by Dr. Crawford, from his experiments relative to animal heat, Mr. Hewſon's on the Blood, &c. which taken together, will form a conſiderable body of evidence in confirmation of the opinion.

Dr. Goodwin obſerves, when an animal is immerſed in water, his Pulſe becomes weak and frequent, he feels an anxiety about the Breaſt, and ſtruggles to relieve it; in theſe ſtruggles he riſes towards the ſurface of the water, and throws out a quantity of air from his Lungs; after this his anxiety encreaſes, his Pulſe becomes weaker, the ſtruggles are renewed with more violence, he riſes towards the ſurface again, throws out more air from his Lungs, and makes ſeveral efforts to inſpire; and in ſome of theſe efforts a quantity of water commonly paſſes into his mouth, his ſkin then becomes blue, particularly about the face and lips; his Pulſe gradually ceaſes, the ſphincters are relaxed, he falls down without SENSATION, and without MOTION.

If the body be immediately opened, Dr. Goodwin obſerves it has the following appearances.

Firſt, The external ſurface of the Brain is of a darker colour than uſual, but the veſſels are not turgid with Blood, nor are there any marks of extravaſation about them.

Secondly, The cavity of the Lungs contain a conſiderable quantity of frothy fluid, and the pulmonary Arteries and Veins are filled with black Blood throughout their whole extent.

Thirdly, The right auricle and ventricle of the Heart are ſtill contracting and dilating, the left *ſinus venoſus* and auricle move feebly, but the left ventricle is at reſt.

Fourth, The right auricle and ventricle are filled with black Blood, and the left *ſinus venoſus*, and left auricle alſo, but the left ventricle is only about half filled with the ſame coloured Blood.

Fifth, The trunks and ſmaller branches of the arteries proceeding from the left ventricle, contain a quantity of this black Blood, alſo.

Mr. Hewſon, in his experimental inquiry into the properties of the Blood, page 7, "The ſurface of the craſſamentum, when not covered with a ſize, is in general of a more florid red than the Blood was when firſt taken from the vein, whilſt its bottom is of a dark colour, or blackiſh; this floridneſs of the ſurface is juſtly attributed by ſome of the more accurate obſervers to the air, with which it is in contact, for if the craſſamentum be inverted, the colours are changed, at leaſt that which is now become the upper ſurface, aſſumes a more florid redneſs; this difference of colour, others have endeavoured to explain from the different proportions of the red particles or globules, as they are called; which, ſay they, being in a greater proportion at the bottom of the craſſamentum, make it appear black, but if inverted, the globules then ſettle from the ſurface, which is now uppermoſt, and that becomes redder; but this I think, Mr. Hewſon goes on to ſay, is not probable, for the lymph in the craſſamentum, is ſo firmly coagulated, as to make it too denſe to allow of bodies even heavier than the red particles to gravitate through it; for example, gold, that air has the power of changing the colour of the Blood, has been long known, and the following experiment ſhews it very ſatisfactorily, and hardly leaves room to refer the appearance to another cauſe.

EXPERIMENT III.

Having laid bare the jugular vein of a living rabbit, I tied it up in three places, then opening it between two of the ligatures, I let out the Blood, and filled this part of the vein with air; after letting it reſt a little, till the air ſhould become warm, I took off the ligature, which ſeparated the air from the Blood, and then gently mixed them, and I obſerved the venous Blood aſſumed a more florid redneſs, where it was in contact with the air bubbles, whilſt in other parts it remained of its natural colour.

Mr. Hewſon goes on, and ſays, there is a difference between the arterial and venous Blood, in colour, the former is of a florid red, like the ſurface of the craſſamentum, the latter is dark or blackiſh, like the bottom of the craſſamentum; this change in its colour is produced on the Blood as it paſſes through the Lungs; as we ſee by opening of living animals, and as a ſimilar change, is produced by air applied to Blood out of the body, it is preſumed, that the air in the Lungs is the immediate cauſe of this change, but how it effects it, is not yet determined.

That this change is really produced in the Lungs, Mr. Hewſon ſays, I am perſuaded from experiments, in which I have diſtinctly ſeen the Blood of a more florid red, in the left auricle, than it was in the right; but ſome authors of the greateſt authority ſay, that they could not obſerve any ſuch difference in a great number of experiments, which they made, but this I ſhould attribute to their having been later in opening the left auricle after the collapſing of the Lungs than I was, for it ſeems probable, that whatever is the alteration produced on the Blood in its circulation through this organ, that change cannot take place after it is collapſed, as the Blood is changed to a more florid red in paſſing through the Lungs, or from the venous to the arterial ſyſtem, ſo, Mr. Hewſon ſhews it loſes that colour again in paſſing from the arteries to the veins in the extreme parts, eſpecially when the perſon is in health, but every now and then we obſerve the Blood in the veins more florid than is uſual, and it likewiſe frequently happens in veneſection, that the Blood which comes firſt out is blackiſh, and that which comes afterwards is more florid; in ſuch caſes the arterial Blood paſſes into the veins without undergoing that change which is natural to it".

LOWER * obſerved long ago in living animals, that the Blood from a wound in the trunk of the pulmonary vein, was florid, and knowing before that the Blood entering into the Lungs by the pulmonary artery, is black; he concluded that it acquired this florid colour by paſſing through the Lungs, and finding afterwards, that when the animal ceaſed to breathe, the Blood from the wound in the pulmonary vein was black, he could not do otherwiſe than attribute the florid colour to the action of the air in reſpiration.

To examine this fact with particular attention, Dr. Goodwin procured ſeveral large dogs, removed the ſternum, expoſed the trunks of the pulmonary veins, and arteries, ſo as to allow him to diſtinguiſh accurately the colour of the Blood paſſing through

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* Tractatus de Corde, p. 185.

through them; then he inflated the Lungs with a pair of bellows (after the deſcription of Veſalius*) imitating the natural reſpiration, and kept the animal alive by this proceſs for a conſiderable length of time.

In theſe experiments it was obſerved the Doctor ſays, that during the inflation, the Blood in the trunks of the pulmonary artery was black, but in the trunks of the pulmonary veins it was florid, and when the inflation was intermitted for a minute, the Blood in the trunks of the pulmonary vein became gradually black, like that in the arteries.

Dr. Goodwin, in ſome of theſe animals, divided the trunks of the humoral artery and vein, and during the inflation, the Blood from the artery was florid, but, on intermitting the inflation, it became gradually black, like the Blood from the vein.

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* Veſalius de Corporis Humani Fabrica, lib. vi. chap. xix, p. 572.

Dr. Goodwin alſo examined theſe appearances in the toad, and the lizard, whoſe Lungs conſiſt of only a tranſparent bladder, with Blood veſſels, ſo thin that the colour of the circulating Blood may be eaſily diſtinguiſhed through them.

The Doctor inflated the Lungs of theſe animals ſeveral times, and emptied them again by gentle preſſure, imitating by this method the reſpiration of the more perfect animals, and in all the examples, when the atmoſpheric air paſſed into the Lungs, the Blood in the pulmonary veſſels became gradually florid; but when they were emptied, it became gradually black.

I ſhall not employ more time in extracting from other authors, any experiments, in ſupport of this fact, that the Blood acquires a florid colour in its paſſage through the Lungs, and that this colour is produced by communication with atmoſpheric air, the reſpectability of the authors, that made the experiments, which has here been brought forward, is ſo great,

that

that what has been ſaid, will amount to ſufficient evidence of the fact.

We next enquire, how atmoſpheric air effects this change, Dr. CRAWFORD, *in his very learned work, entitled* "*Experiments and Obſervations on Animal Heat, and the Inflammation of Combuſtible Bodies*," in page 143, alluding to ſome experiments made by him, obſerves,

"The foregoing experiments prove in general, that fleſh, milk, and vegetables, contain leſs abſolute heat than water, and water leſs than arterial Blood, arterial Blood therefore, contains a greater quantity of abſolute heat, than the principles of which it is compoſed."

"The remarkable accumulation of heat in this fluid, led me to ſuſpect, that it abſorbs heat from the air, in the proceſs of reſpiration; and in this ſuſpicion Dr. Crawford ſays, I was much confirmed by the following conſiderations."

Firſt, Thoſe animals which are furniſhed with Lungs, and which continually inſpire the freſh air in great quantities, have the power of keeping themſelves at a temperature, conſiderably higher than the ſurrounding atmoſphere; but animals that are not furniſhed with reſpiratory organs, are very nearly of the ſame temperature with the medium, in which they live.

Secondly, Among the hot animals, thoſe are the warmeſt, which have the largeſt reſpiratory organs, and which conſequently breathe the greateſt quantity of air, in proportion to their bulk; thus, the reſpiratory organs of birds, compared with their ſize, are more extenſive than thoſe of any other animal, and birds have the greateſt degree of animal heat.

Thirdly, In the ſame animal, the degree of heat is in ſome meaſure proportionable to the quantity of air inſpired in a given time; thus we find that animal heat is increaſed by exerciſe, and by whatever accelerates reſpiration.

From theſe conſiderations, Dr. Crawford was naturally led to a more particular examination of this ſubject, the reſult of which is comprehended in the following propoſitions.

PROPOSITION I.

The quantity of abſolute heat contained in pure air, is diminiſhed by the change which it undergoes in the Lungs of animals; and the quantity of heat in any kind of air that is fit for reſpiration, is nearly proportional to its power in ſupporting animal life.

PROPOSITION II.

The Blood which paſſes from the Lungs to the Heart, by the pulmonary vein, contains more abſolute heat than that which paſſes from the Heart to the Lungs by the pulmonary artery.

As the former is the Blood which is propelled through the arteries in the aortic ſyſtem, and the latter is that which in the ſame ſyſtem is returned by the veins; I ſhall call the firſt, arterial, and the laſt, venous Blood.

PROPOSITION III.

The comparative quantities of heat in bodies ſuppoſed to contain phlogiſton, are encreaſed by the changes which they undergo in the proceſſes of calcination and combuſtion.

PROPOSITION IV.

When an animal is placed in a warm medium, the colour of the venous Blood approaches more nearly to that of the arterial, than when it is placed in a cold medium, the quantity of reſpirable air which it phlogiſticates, in a given time, in the former inſtance is leſs than that which it phlogiſticates, during an equal ſpace of time, in the latter; and the quantity of heat produced, when a given portion of pure air is altered by the reſpiration of an animal is nearly equal to that which is produced, when the ſame quantity of air is altered by the burning of wax or charcoal.

That the difference between the colour of the venous and arterial Blood, in a living animal, is diminiſhed by expoſure to heat, and encreaſed by cold, appears from the following experiments.

For the proof of the truth of theſe four propoſitions, muſt refer the reader to Dr. Crawford's very elaborate work, on animal heat, he will find they are demonſtrated by a great variety of ingenious and accurate experiments.

Let us now bring forward, and enquire into the evidence we have produced, and ſee how much it makes, for the immediate cauſe of death after ſubmerſion, which we have adopted, viz. "That the Blood having loſt its ſtimulating effect, in conſequence of ſuſpended reſpiration, is the cauſe of all the appearances, that this enquiry is of importance will be acknowledged; for, when the cauſe is eſtabliſhed, the indication of recovery will be alſo eſtabliſhed."

Upon opening the bodies of animals that have been drowned, Dr. Goodwin has obſerved, that the right auricle and ventricle, the pulmonary arteries and veins, as alſo the *ſinus venoſus*, and left auricle are compleatly filled with black Blood; that the left ventricle is only about half full of Blood, of the ſame colour.

Now we have found, from the obſervations of LOWER, Mr. HEWSON, and Dr. GOODWIN, that the Blood of animals acquire a florid colour, in circulating through the Lungs, when that organ is not interrupted in the performance of its function; and Dr. CRAWFORD has made it appear by the firſt and ſecond propoſitions, that the atmoſpheric air loſes a part of the heat it contains in the Lungs; and that the Blood which paſſes from the Lungs to the Heart, by the pulmonary vein, contains more abſolute heat than that which paſſes from the Heart to the Lungs, by the pulmonary artery.

Are we not to conclude, from theſe facts, that as the air loſes a portion of its elementary fire, at the ſame time and place, where the blood receives heat, that what the air parts with, the Blood receives? or, are we (contrary to the rules of philoſophiſing of the great Sir Iſaac Newton,*) *to admit more of causes natural things, than ſuch as are both true and ſufficient to explain the appearances?*

We muſt admit, that the exciting power, communicated by the air, to the Blood in the Lungs, and which is abſolutely neceſſary to keep up the contraction of the Heart, is HEAT; we muſt be obliged then to conſider HEAT *as the* MAIN-SPRING *of Motion in an animal body, and as this* MAIN-SPRING *is immediately derived from an external agent, ſo it ſtands an inconteſtable proof of the truth of the fundamental principle of the immortal* BROWN, "*That animal life is a forced ſtate of exiſtence,*" upon this foundation, that great man erected two GRAND PILLARS, which may be ſaid to repreſent the whole catalogue of general diſeaſes; as they are diſeaſes that originate from *encreaſed or diminiſhed excitement*; *between theſe* PILLARS, *there is a flooring, in the center of this flooring ſtands the* GODDESS OF HEALTH, *the ſpace on each ſide repreſents prediſpoſition to thoſe diſeaſes, inſcribed on a regular ſcale upon each of the* PILLARS; *upon one of theſe* PILLARS *is engraved the words* "STHENIC DISEASES," *upon the other* "ASTHENIC DISEASES."

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* Vide, Newtoni Princip. lib. iii, p. 202.

It is with great propriety that we ſee univerſal diſeaſes, or diſeaſes of the ſyſtem ſo divided, for that the diſeaſes belonging to each claſs, differ only in degree from others of the ſame claſs; and as they all yield to the ſame kind of remedies, the proper application of theſe remedies, will deſerve the ſerious attention of the practitioner, the powers that produce one claſs of diſeaſes, being the remedies for the other, and *vice verſa*, it neceſſarily follows; that if we over apply our remedies, we convert a diſeaſe of the one claſs, into a diſeaſe of its oppoſite; for example, if we in peripneumony carry the antiphlogiſtic treatment, as it has been called too far, we may convert peripneumony into hydrothorax.

STHENIC DISEASES depending on encreaſed excitement, are to be cured by diminiſhing the excitement, and this is eaſily effected by withholding the exciting powers, which all act by a ſtimulating operation, (more or leſs) and as a principal means of doing this, we Bleed, and that according to the neceſſity, and employ ſuch other remedies, and enjoin ſuch a regimen as coincide with our indication of cure, viz. to diminiſh the excitement.

ASTHENIC DISEASES, or diſeaſes of debility, depend on the contrary upon diminiſhed excitement; theſe diſeaſes occupy by far, the greateſt part of the catalogue, and are much more frequent in large cities and towns, than they are in the country, our indication of cure is extremely evident here, to wit, directing ſuch medicines to be taken, as will have a ſtimulating effect, and aſſiſt theſe medicines in their operation by a ſtimulating regimen, which conſiſts in allowing the patient a ſufficient quantity of freſh animal food, and good drink ; by theſe means the excitement will be encreaſed, and the diſeaſe cured.

I have often thought from being enlightened, (infatuated ſome of my readers I know will ſay) by the Brunonian doctrine, how very wiſely we have often acted with regard to this claſs of diſeaſes ; when a patient falls into a diſeaſe of this claſs, we will not ſuffer him to eat animal food, if he has a deſire for it, for we put him upon a vegetable diet ; but it will often be the caſe, that the ſtomach has no deſire for food of this kind; now if we make no exertion to oblige the ſtomach to take in and properly digeſt, when taken in, a certain quantity of the more permanent ſtimuli, ſuffer him to quench his aſthenic thirſt, by debiliating liquids, for which there is a great deſire, inſtead of ordering him to take in the more diffuſible ſtimuli, it is evident what will be the fate of the patient; after ſome little time has elapſed, and we find our patient is *a going*, if it will any way, from his ſituation in life, allow him to leave town, and retire into the country, we direct him to do ſo, and to take exerciſe; *he leaves off his medicines, retires into the country, uſes exerciſe, gets well, and d—— his Doctor.*

How is it that he receives a cure in the country? by uſing exerciſe, he is obliged to take in a greater quantity of AIR, which AIR contains a greater quantity of HEAT *than the air which he had breathed leſs of in town, by taking in a far greater quantity of heat from the air than he had previouſly done, very conſiderable ſtimulating effects are produced, a deſire for food ſoon returns, health is re-eſtabliſhed.*

Is it not extremely clear, that men who live ſedentary lives in town, require to be better ſupported with animal food and good drink, than thoſe who live in the country, and uſe exerciſe for the above reaſons.

A mode of living neceſſary to ſecure men, who reſide in town from falling into diſeaſes of debility, would, if followed by people in good health in the country, prediſpoſe to diſeaſes of the oppoſite nature, to wit. the inflammatory.

Indeed this obſervation is juſtified by experience, for it is well known that inflammatory diſeaſes are much more frequent in country places, than they are in great cities and large manufacturing towns, conſequently bleeding and the other antiſthenic treatment will be oftener required.

One obſervation more, and we return to the ſubject; this metropolis is continually recruiting with young people from the country, from cuſtom, more than neceſſity, they Bleed once or twice in the year; they continue the practice in town, and without doubt receive great injury, they apply to us with the intention of being let Blood; cuſtom ſtamps their opinion, and it would be in vain for an individual to attempt to diſſuade them from it.

It may poſſibly be ſaid, that taking ſix or eight ounces of Blood, in theſe caſes, can do no great miſchief, even if there is no ſthenic diatheſis, and conſequently no neceſſity for the operation.

That no evident miſchief enſues, we grant, which is ſo much the worſe, if evident miſchief inevitably followed cloſe to the heels of every improper act, mankind would look around them. Univerſal diſeaſes are always preceded by prediſpoſition, if there exiſts the leaſt prediſpoſition to thoſe diſeaſes, which depend on the diminution of excitement, at the time we take Blood; it will not I apprehend be denied, that we encreaſe the prediſpoſition, and this prediſpoſition very often continues to be encreaſed from time to time, by other debilitating applications, until at length diſeaſe unfortunately arrives, and thoſe perſons who have not been taught to counteract prediſpoſition, will not know how to remove a diſeaſe ſucceeding prediſpoſition, they will not know how to ſtem the torrent, death will advance with haſty ſtrides, in ſome thouſands of caſes, and life, that very valuable concern, will be taken from us, ignorant mortals as we are.

Material alteration in medicine, can never be put in execution by individuals; it would require the mandate of the whole College of Phyſicians to overcome popular prejudice; inoculation has been introduced ſeventy years, men of eminence ſtarted objections to it, thoſe objections operate to this hour, upon the minds of the poorer ſort of people, and who are by much the majority, if the ſmall-pox is within their doors, and you would wiſh to inoculate thoſe who have not had the diſeaſe, it is very ſeldom you are permitted, it is ſpending time to no purpoſe, and throwing argument away, to attempt to perſuade them that there is no danger to be apprehended from a double infection, which cannot take place.

Dr. Brown's theory of medicine is plain, eaſy to be comprehended, but the practice founded on that theory, demands the greateſt attention, it teaches us how to cure diſeaſes, upon a rational principle, and it cautions us againſt over applying our remedies, which are to be conſidered as exciting powers, leſt we defeat our intention.

When we are in a ſick room, and have paid attention to every circumſtance connected with the diſeaſe before us; before we ſet about to cure the diſeaſe, we have only to aſk ourſelves three queſtions, to wit. is this diſeaſe UNIVERSAL or LOCAL? is it STHENIC or ASTHENIC? next, *what is its degree?*

To determine theſe queries, will in many caſes require the greateſt exertion of judgment, in men of the greateſt abilities; but they muſt be determined; if we do not draw a right concluſion, we can never cure a ſingle diſeaſe, if a miſtake is made, the conſequences may be fatal.

That the Brunonian doctrine has been conſiderably injured by injudicious practitioners, I am well convinced; but is it poſſible that want of judgment, in the followers of the doctrine, ſhould be made uſe of as an argument againſt the doctrine itſelf?

Dr. Brown has directed us how to ſteer our courſe between *Scylla* and *Charybdis*, as well as the nature of the different circumſtances will admit of; if we injure the veſſel committed to our care, it is not the fault of the Doctor; or indeed, is it always ours. But, I ſhall give an example or two which will ſerve to ſhew that it ſometimes is our fault.

Suppoſe that we are ſent for to a caſe of TYPHUS FEVER, we know that we are to ſtimulate, but we are to ſtimulate, only ſo far as the neceſſity of the caſe demands, that is, we are to counteract debility; but, is there no diſcrimination required here? are we to give opiates and wine, in three times the neceſſary quantity? if we do this, we act as wiſely as a *miller would, if he ſolicited the foreign power, which communicates motion to his mill, to deſtroy it, by filling the ſails with cloth in a hurricane.*

Again, ſuppoſe we are ſent for to a caſe of ENTERITIS, we recollect that there exiſts no neceſſity for bleeding, there being no *Excitement* to take down; on the contrary, we perceive from the ſtate of contraction of the Heart and arteries, as is demonſtrated by the pulſe, that general debility is induced; our knowledge of the doctrine here fails us perhaps, and we direct our remedies to the *ſymptoms of diſeaſe*, prematurely give ſtimulants, the moſt powerful in kind, with the view of counteracting debility, and to remove pain, totally forgetting that *the inflammation is local*, depending on certain hurtful powers locally applied as its cauſe, and equally forgetting that well known axiom, *ſublata cauſa tollitur effectus.*

Many inſtances might be enumerated, where from not being ſufficiently acquainted with our author, we are precipitated into error, thoſe who are not friendly to the doctrine, hear of the circumſtance, very kindly exculpate us, and place the error to the author's account.

An enquiry into the nature of animal life, is of the firſt importance, that man who beſt knows the tenure, on which we enjoy life, will beſt know how to regulate the animal machine, in its different deviations from the ſtandard of health; metaphyſics ſhould not be had recourſe to in ſuch an enquiry, the ſcience is too abſtruſe, too far removed from human comprehenſion, and not neceſſary for our purpoſe, moſt probably the intellectual faculty operates upon living matter, in the ſame way as the external agents, namely, by ſtimulating. The paſſions we know have a very conſiderable ſhare, in encreaſing or diminiſhing excitement, and which (if well regulated) muſt have a tendency to prolong life, different modifications of the ſame paſſion, by being violently, and ſuddenly applied, may produce ſuch effects, upon the machine, as to occaſion death in two different ways, viz. by cauſing ſo great a ſtimulus to be applied, as will deſtroy the excitability, or it may produce ſuch a debilitating effect, as totally to ſuſpend all excitement.

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FROM the many very ingenious obſervations and experiments of Dr. GOODWIN *in his work entitled* "*the Connection of Life, with reſpiration,*" much information appears on the ſubject of apparent death, from ſubmerſion, &c. and to which I beg leave to refer my readers, as I have no deſire to enlarge theſe obſervations, but wiſh to turn them out of hand as ſpeedily as poſſible.

And I would alſo beg leave to refer them to Dr. CRAWFORD's *Obſervations and Experiments on Animal Heat*, they will there find, " that *animal heat* depends upon a proceſs reſembling a chemical elective attraction, the pure air is received into the Lungs, containing a great quantity of elementary fire, the Blood is returned from the extremities, impregnated with the inflammable principle, the attraction of pure air to the latter principle is greater than that of the Blood; this principle will therefore leave the Blood to combine with the air, by this combination, the air is obliged to depoſit a part of its elementary fire, and as the capacity of the Blood is at the ſame moment encreaſed, it will inſtantly abſorb that portion of fire, which had been detached from the air; the arterial blood, in its paſſage through the capillary veſſels, is again impregnated with the inflammable principle, in conſequence of which its capacity for heat, is diminiſhed, as appears from the experiments, which have been recited in proof of the ſecond propoſition."

" It will therefore, in the courſe of the circulation, gradually give out the heat, which it had received in the Lungs, and diffuſe it over the whole ſyſtem: thus it appears, Dr. Crawford ſays, that in reſpiration the Blood is continually diſcharging, the inflammable principle, and abſorbing heat, and that in the courſe of the circulation, it is continually imbibing this principle, and emitting heat."

When Blood of a florid colour, enters the left auricle, the heart contracts, and that in proportion to the degree of heat which the Blood contains; but when reſpiration is obſtructed, the ſource from which the Blood derives heat, is cut off, and the left auricle and ventricle contract weakly and quickly, and very ſoon ceaſe to propell the contents; this ceſſation of contraction can only ariſe from a defect of ſtimulating power in the Blood, the Heart has ſuſtained no injury, its capability of contracting is the ſame, renew the communication between the air and the Blood in the Lungs, the ſtimulus will be applied, and the left auricle and ventricle will contract as uſual.

To what other cauſe can we attribute the non-contraction of the left auricle and ventricle, than to defect of ſtimulus; the left ſide of the Heart has received no injury, if injury done to it, why not to the right auricle and ventricle alſo, it is well ſupplied with Blood, it has propelled ſome of the phlogiſticated Blood, for Blood of a black colour, is found in the larger trunks of the aorta, but it will not long propell this Blood.

If the left auricle and ventricle was capable of contracting, and propelling the Blood, when reſpiration is ſuſpended; there is little doubt but it would be ſupplied with that fluid; but this is impoſſible; a foreign exciting power muſt be applied.

If life could be ſupported, without the application of foreign exciting powers; or if thoſe powers would always produce the ſame effect when applied, there is no ſaying the duration, under certain circumſtances and precluding accidents, which might happen to the conſtituent parts of the machine, to which it might not be extended.

But this, very fortunately for mankind, is not the caſe, for if accident or diſeaſe

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does not intervene, and put a period to life, and man continues to live in the practice of temperance in the ſtricteſt point of view, or adapts the excitement to the excitability, or properly applies the different univerſal ſtimuli; all of which I conceive are ſynonimous expreſſions, yet debility and old age will overtake him, and death follow.

For this reaſon.—The exciting powers which act by a ſtimulating operation (more or leſs) by having been of neceſſity conſtantly applied, produce leſs and leſs effect or excitement, and man dies becauſe greater exciting powers cannot be applied; the excitability no longer capable of being acted upon, ſo that the *powers*, which ſupport life, prove alſo the cauſe of death, by ſtimulating and gradually wearing down the principle of life, or by conſtant application, cauſing that principle, to be no longer ſuſceptible of their operation.

Suſpended reſpiration does not appear to have that influence on the right auricle and ventricle, as on the left; for Dr. Goodwin obſerves, that the right auricle and ventricle continue their contractions for ſome time after the left is at reſt, and they ceaſe to contract, it would appear from a total obſtruction taking place in the left auricle.

And this we may account for, from conſidering that the right ſide of the Heart, though the weakeſt, has always been uſed to contract upon Blood, far leſs ſtimulating, and is not by any means effected by the defect of ſtimulus in the Blood, in the Lungs, and left auricle.

I SHALL now proceed to make ſome OBSERVATIONS ON THE MODE OF TREATMENT, EMPLOYED FOR THE RECOVERY OF PERSONS APPARENTLY DEAD, AFTER SUBMERSION, HANGING, &c.

In the recovery of perſons apparently dead, from drowning, Mr. Kite thinks there are two indications.

Firſt, To remove compreſſion of the Brain, and congeſtion about the Heart, and Lungs.

Secondly, To excite the irritability of the muſcular fibres.

If Mr. Kite's opinion, that the internal immediate cauſe of death is to be aſcribed to the induction of apoplexy be true, theſe two indications, unavoidably preſent themſelves.

The opinion that we have given is, that the cauſe of death is to be attributed to the Blood, being rendered unfit for performing its office, by the want of the action of the air in reſpiration.

Viewing the matter in this light, only the latter indication will be found to obtain, viz. to excite the irritability of the muſcular fibres, coincident with this indication; we ſee a variety of ſtimulating articles recommended, which are directed to be applied to different parts of the body, but a decided preference is not given to that ſtimulus, (except by Dr. Goodwin) which moſt clearly is entitled to it, for that it produces its effect by direct agency. For the maintainance of animal life, it is more immediately neceſſary, that the BRAIN, HEART, and LUNGS, *perform their functions without interruption.*

But, if from any cauſe, the *Lungs* are prevented from executing their office, the

Heart ſoon ceaſes to contract, motion and ſenſation are no longer enjoyed, and apparent death is the conſequence.

The contraction of the Heart, and the ſubſequent motion of the Blood, depending on the Lungs, if we attempt to reſtore the circulation of the Blood, by any other means, than by imitating the natural function of that organ, we are beginning at the wrong end.

The firſt thing to be done is to inflate the Lungs, and re-produce the natural heat, the application of local ſtimulants, there can be no objection to, provided they do not employ our time, and divert our attention from the principal object.

By inflating the Lungs with air, if any *excitability* remains, our endeavour amount to this.—We communicate from the air to the Blood in the Lungs, and left auricle, a *ſtimulus*, which *ſtimulus* will be applied to the principal organ of circulation; where, if the *excitability* is not totally extinguiſhed, it is certain to be found; other means will ſecond our efforts to renew the circulation of the Blood, but none will do as much for us in this reſpect, as artificial inflation of the Lungs.

THE HEART, *being the principal reſidence of animal life, the primary organ of circulation, where* MOTION *is firſt to be produced, and where our efforts ought certainly to be directed.*

If we (by inflation) communicate to the Blood in the veſſels of the Lungs and left auricle, that degree of *exciting power*, which it has been deprived of, by the ſuſpenſion of reſpiration, if any *excitability* remains, it will produce its former effect, for the *Heart* paſſive, in this reſpect, will be *forced* to contract.

When the *Heart* is ſtimulated to contract, the ſtimulating power is propelled; its application to the ſides of the *arteries*, ſtimulate thoſe veſſels to contract alſo, as being endowed with the ſame principle of *excitability*, as the *Heart*, different in degree only.

Thus we ſee that the exciting power, being communicated from the air to the Blood, by artificial inflation of the Lungs, the Heart contracts, the ſame effect is produced in the arteries, and the circulation is again compleatly renewed.

The exciting power, we cannot heſitate in being of opinion is heat, in caſes of apparent death, and where the body is not expoſed to a cold medium, we obſerve the great diminution of heat, which has taken place in a ſhort ſpace of time; how are we to account for this circumſtance, if we do not allow atmoſpheric air to be a ſource from which animal heat is derived? the diminution of heat does not depend on the ſuſpenſion of motion in the Blood, for Dr. Fordyce obſerves.—" Fluids* rubbing againſt ſolids, or very ſmall particles of a ſolid, immerſed in a fluid, rubbing againſt one another, or againſt a ſolid, produce no ſenſible heat, therefore, neither the friction of the Blood againſt the veſſels, nor the friction

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[*] Dr. Fordyce, on the Natural Hiſtory of the Human Body, p. 92.

friction of the red particles againſt one another, or againſt the veſſels, produces, maintains, or regulates the heat of the body."

When reſpiration returns, how ſoon the body experiences an increaſe of heat; heat applied to a body externally in caſes of apparent death, ought to be cautiouſly conducted, it might be attended with fatal conſequences to expoſe a body near the heat of a fire.

The attempts that have been made, to put the Blood in motion, by opening a vein, or veins; in thoſe caſes where Blood has been taken, I am of opinion, no good effect has been produced, the arguments that have been made uſe of in favour of this operation, and the caſes recited of patients recovering, after the operation of bleeding had been performed; we cannot conſider as proofs of its utility, thoſe caſes do not amount to a proof, they are inſtances where it was not in our power to counteract the other methods made uſe of for the recovery by bleeding.

If contraction of the Heart has not begun to take place, it is not likely to be forwarded by veneſection, if the Heart has begun feebly to contract, can it be right to arreſt that Blood in its progreſs to the Heart, which is to ſupport and improve the future contractions?

Is it good practice to diminiſh the quantity of Blood in theſe ſituations, with the intention of removing congeſtion about the Heart and Lungs, and compreſſion of the Brain, which is not found to exiſt? when the left auricle and ventricle begin to contract, the accumulation of Blood in the Lungs, will, very ſoon be diminiſhed.*

With regard to compreſſion of the Brain, no ſuch compreſſion in theſe caſes has been

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* As theſe obſervations may fall into the hands of readers who do not know, and may be deſirous of knowing the opinion of the Humane Society, on this ſubject, I ſhall ſub-join an account of the directions given by that ſociety, for the recovery of the apparently dead by drowning, for that account I am indebted to the Editor of the Edinburgh Medical Commentaries; the reader will find the account in thoſe Commentaries for the laſt year.

been found to exiſt. Mr. Kite,* though an advocate for apoplexy being the cauſe of death, in theſe caſes, confeſſes, that he has not been able to find any extravaſation of Blood within the cranium, upon examinations made after drowning; and we might have formed ſuch an opinion *a priori.* When an animal is immerſed in water, Dr. Goodwin obſerves, that the pulſe becomes weaker, ſo that there is abſolutely leſs Blood ſent from the Heart to the Brain, than uſual, and as ſoon, the Doctor‡ ſays, as the left auricle and ventricle ceaſe to contract and propel the Blood to the Head, all the intellectual operations ceaſe, ſenſation and voluntary motion are ſuſpended, and the external ſigns of life diſappear.

It is proved by the experiments of Dr. Prieſtley, that the dark and livid colour of the Blood in the veins depends upon its combination with the inflammable principle in the minute veſſels; this colour of the Blood being more conſpicuous in the face, after ſubmerſion, ſtrangulation, &c. than in other parts of the body, ought not to be conſidered as a proof of a greater quantity of Blood having been determined to the head, for it depends upon the veſſels being more numerous near the ſurface in the face, than in other parts of the body.

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* Mr. Kite's Eſſay on the Recovery of the apparently Dead, p. 45.

‡ Page 89.

Upon the whole, I think we are not to conclude, that a deprivation of *ſenſation* in theſe caſes, depends upon preſſure on the *Brain*, on the contrary, that it depends upon a deficiency of *Blood* ſent to that organ.

Senſation bears the ſame relation, and has the ſame dependence on *motion*, as *motion* has on *reſpiration*, ſuſpend *reſpiration*; *motion* ceaſes when *motion* is ſuſpended; *ſenſation* is ſoon deſtroyed, and the *ſoul* no longer acquainted with the ſituation of the *body*.

The *Brain* cannot ſupply *ſenſation*, if *Blood* is not conſtantly tranſmitted to it from the *Heart*. The *Heart* cannot give *motion* to the *Blood*, *if the Lungs do not ſupply the Blood with atmoſpheric air.*

In our endeavour to recover perſons from apparent death, after ſubmerſion, ſhould we direct our attention to the reſtoring the *function of that organ*, *which was the laſt in having its function deſtroyed?*

We cannot reſtore the function of the *Brain*, or the *Heart* any other way, than by reſtoring the function of that organ, which had it firſt ſuſpended, *and which became the cauſe of the ſuſpenſion of motion and ſenſation.*

And fortunate it is for mankind under theſe unhappy circumſtances, that it is in our power to imitate the natural communication that is carried on between atmoſpheric air and Blood in the Lungs; it is very true, that perſons will often recover from a ſtate of apparent death, in caſes where reſpiration has been only a ſhort time ſuſpended, without artificial reſpiration having been had recourſe to. But to what does that amount.

Artificial reſpiration, by obliging the Lungs to expand, allows of a greater quantity of air, to be applied to a greater ſurface of Blood; but in thoſe caſes, where the Lungs have not been artificially inflated; is it to be ſuppoſed, that atmoſpheric air will not be applied? it is evident that the ſurrounding air will be applied to the Blood, though in a far leſs degree.

When the obſtacle, to the natural communication, carried on between atmoſpheric air and the Blood in the Lungs, is removed, it appears to me at leaſt, that the air will immediately begin to circulate, a quantity of that air, which has been confined in the Lungs, and which is rendered highly phlogiſticated, will eſcape into the atmoſphere, and the preſſure of the ſurrounding atmoſphere, will aſſiſt in filling up the vacancy; the natural chymical elective attraction, will alſo take place, conſequently the effects produced by inflation, will be experienced, differing only in degree.

Provided there is not any thing to impede the free egreſs and regreſs of air, the circulation of that fluid, will inſtantly begin to take place, in theſe caſes; by this means the air in the Lungs, will be gradually changed, the Blood will throw off a quantity of the inflammable principle, and in proportion to the quantity of phlogiſton ſeparated, will heat be abſorbed.

And this proceſs, in caſes where reſpiration has been only a ſhort time ſuſpended, will often be ſufficient to EXCITE the Lungs, to dilate, and effectuate the recovery. But in caſes where reſpiration has been obſtructed a conſiderable length of time, this natural proceſs will not be adequate to the effect, the Lungs will not be EXCITED. Art muſt be had recourſe to, which is here, as in every other caſe it ought to be, when applied to the animal machine, an imitation of nature, if it is intended to relieve her, by ſupplying her defects.

There can be no objection (provided our attention is not diverted from the principal object, viz. inflating the Lungs with air) to the application of thoſe particular ſtimuli, that the different SENSES are ſuſceptible of; we may order a loud noiſe to be made, near the external ear; we may cauſe ſtrong ſtreams of light to fall upon the expanſion of the optic nerve, at the bottom of the eye; we may apply ſternutories, and volatile alkali to the noſtrils, to ſtimulate the olfactory nerves, expanded upon the ſniderian membrane; we may cauſe the tongue to be rubbed with acrid ſubſtances, ſtimulate the ſenſe of feeling, by various means; and we may have recourſe to electricity; at the ſame time, I cannot avoid ſaying, for the reaſons that has been before aſſigned, that all theſe things, appear to me, as very unſcientific.

We often attribute effects, to cauſes, that have not operated ſo as to produce thoſe effects; and I ſtrongly ſuſpect, that in caſes of apparent death, from accidental ſuſpenſion of the function of the Lungs, many of the methods made uſe of for the recovery, have acquired a degree of reputation, to which they can have no real pretenſion, and that their only merit conſiſts in their not retarding or counteracting the efforts of nature, or the judicious efforts of art made uſe of for the recovery.

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AS INFLATING the LUNGS, with AIR, in caſes of APPARENT DEATH, from SUBMERSION, STRANGULATION, NOXIOUS AIR, &c. ought to be our principal deſign, I ſhall make a few OBSERVATIONS on that ſubject.

At the time when I was a ſtudent, which is not many years ſince, for the purpoſe of inflating the Lungs with air, in theſe caſes, ſome of the profeſſors of anatomy and ſurgery, ſeemed to entertain the opinion, that the operation of tracheotomy, was abſolutely neceſſary.

And I very well recollect hearing Mr. Juſtamond obſerve, that when he lived upon the Terrace in Palace-Yard, Weſtminſter, a boy was brought to him that had been drowned in the *Thames*; he made an opening into the trachea for the purpoſe of inflating the Lungs, but that the hemorrhage was ſuch as gave him no chance of ſucceeding in the recovery, for he was not able to prevent the Blood from paſſing down to the Lungs, conſequently no benefit was to be expected from inflation, as the atmoſpheric air could not be brought in contact with the phlogiſticated Blood in the pulmonary veſſels, and left auricle. Now as ſuch an unpleaſant circumſtance happened to ſo very eminent a man as Mr. JUSTAMOND, we have reaſon to fear it might alſo happen to others.

But, experience ſeems to have taught us, that tracheotomy, in theſe caſes is not abſolutely neceſſary, for that the Lungs may be inflated, by the mouth, cloſing the noſtrils, or by one of the noſtrils cloſing the other, and the mouth, though it may in ſome caſes, perhaps, require a good deal of addreſs to effect it, for the air may find its way into the *Oeſophagus* inſtead of the *Larynx*, there may be a contraction or adheſion of the epiglottis; when this is the caſe, Mr. Kite obſerves, " we ſhall generally remedy the inconvenience by bringing the tongue forwards, which being connected to the epiglottis, by inelaſtic ligaments, muſt of courſe be elevated.

This ingenious author, goes on by obſerving, " ſhould any further impediment however occur, the crooked tube, bent like a male catheter, recommended by Dr. Monro, and mentioned by Mr. Portal, Mr. le Cat, and others, ſhould be introduced into the glottis, through the mouth, or one noſtril, the end ſhould be connected to a blow-pipe, or what will be more convenient, the pipe for the noſe belonging to the elaſtic tube, may be removed, and this inſtrument ſcrewed in its place, according to the plan mentioned in the deſcription of a pocket caſe of inſtruments, for the recovery of the apparently dead, by Mr. Savigny."

When every attempt to inflate the Lungs, has been made in vain, Mr. Kite obſerves, page 147, " Tracheotomy is our laſt expe- " dient, and ought to be performed as " ſoon as it becomes neceſſary. I ac- " knowledge however, I ſhould not expect " it would ſucceed, when the other means " have failed; but as I have not had " occaſion to perform it more than once, " I cannot ſpeak deciſively on the ſubject, " it muſt be left therefore, to be aſcer- " tained by future experience; in the " caſe alluded to, the Lungs could not " be inflated by the means recommended " by the ſociety, and no tubes being at " hand, I made an opening into the trachea, " in which was introduced a common " diſſecting blow-pipe; but after all, I was " not able to produce the leaſt motion of " the cheſt. This was occaſioned by the " want of proper inſtruments, and it is " probable the crooked pipe, ſcrewed on " the elaſtic tube, would effectually an- " ſwer on ſimilar occaſions."

In this caſe, where Mr. Kite performed the operation of tracheotomy, no notice being taken of hemorrhage, we are to conclude, that he avoided wounding thoſe Blood veſſels, which other gentlemen have accidentally fell in with, when they performed the operation.

Mr. Kite, after treating of air, loaded with the vapour of tobacco—of the volatile alkali—of the ſpirit of ſea ſalt—and ſpirit of ſulphur, which has been recommended with the view of exciting the action of the Lungs with greater expedition, ſays, page 149. " This practice I conſider, not only as of doubtful effect, but in general as extremely hazardous, and replete with danger."

This gentleman goes on by obſerving, " With fairer proſpect of ſucceſs is the " dephlogiſticated air of Dr. Prieſtley re- " commended for the ſame purpoſe, Dr. " Fothergill, in particular, has diſtinguiſhed " himſelf, by his truly ingenious remarks " on its application to the ſubject now

“ under our conſideration. It muſt be
“ obſerved, however ; that in this inſtance
“ the Doctor's practice, ſeems entirely
“ influenced by a theory, which ſuppoſes
“ the cauſe of death, in drowned people,
“ to be noxious air, ſtagnant in the cells
“ of the wind-pipe, and as this ſpecies of
“ air, neutraliſes mephitic air, and ren-
“ ders it reſpirable”, it ſeems, ſays the
Doctor, “ to be the direct antidote ſupplied
“ by nature, for correcting the contami-
“ nated air, ſtagnant in the bronchial
“ cells, and alſo for inflating the Lungs
“ in preference to common air.

“ When treating on the ſuppoſed cauſes
“ of death, this theory received, what in
“ an eminent degree it merited, a full
“ and candid inveſtigation;” but the
reader will remember, that the ſum and
concluſion of the arguments and experiments was, that, “ the death of animals
“ cannot be attributed to the action of
“ phlogiſton on the nerves of the Lungs.”
If therefore, this deduction be true, it
does not immediately appear, Mr. Kite
obſerves,

obſerves, why dephlogiſticated air ſhould be uſed for the purpoſe of inflating the Lungs, in preference to common air.

I have quoted this paſſage from Mr. Kite, not only to ſhew Dr. Fothergill's opinion of the cauſe of death, after ſubmerſion, and the ſuperior advantage, which would accrue from the application of dephlogiſticated air, in theſe caſes; but alſo to ſhew, that, "*the death of animals in theſe caſes, cannot be attributed to the action of phlogiſton on the nerves of the Lungs.*" And although Mr. Kite does not immediately perceive, why dephlogiſticated air, ſhould be uſed for the purpoſe of inflating the Lungs, in preference to common air. I will endeavour to prove, before theſe obſervations are concluded, and I hope very ſatisfactorily, that dephlogiſticated air, is moſt eminently preferable to atmoſpheric air, for that atmoſpheric air is fit for the reſpiration of animals, only, on account of, and in proportion to the quantity of dephlogiſticated air it contains.

Mr. Kite, page 152, ſpeaking of the application of dephlogiſticated air, as recommended by Dr. Fothergill, in caſes where animals have been deſtroyed, by inſpiring noxious air, obſerves, “ that if noxious air is actually drawn into the Lungs, which we ſhall find in another place, to be extremely probable, the application of pure air, may then, ſaturate and correct the incloſed contaminated air, ſo as to render it harmleſs and inoffenſive.”

But, Mr. Kite goes on to obſerve,
“ as I cannot find any deciſive experi-
“ ments have been made with this fluid
“ on drowned animals, I muſt acknow-
“ lege that after all that has been ſo ably
“ and judiciouſly urged in its ſupport; it
“ appears to me as of little conſequence,
“ or at leaſt as a ſecondary conſideration,
“ whether the Lungs are inflated with
“ dephlogiſticated or atmoſpheric air, or
“ whether the air be blown from the
“ Lungs of a healthy perſon, *it is their*
“ EXPANSION *and* CONTRACTION, *we are*
“ *to endeavour to promote, in order to* FORCE
“ *the Blood, from the right to the left ventricle of*

“ *the Heart, and if that can be properly*
“ *effected, it will, for obvious reaſons, be*
“ *the moſt probable means of re-producing the*
“ *circulation.*”

As this opinion of Mr. Kite's, totally militates againſt every idea I have on the ſubject, I am very certain, that gentleman will excuſe me in attempting to refute it.

That mechanics, have taken many things from the conſtruction of the animal machine, there can be no doubt, animals, particularly the human ſpecies, are conſtructed upon the beſt mechanical principles, and from it, mankind will do well to copy; but it does not appear to me, that animals are kept alive by mechanic force. Animals are MECHANICALLY conſtructed, but they are CHEMICALLY kept alive.

We have found, that the veſſels in the Lungs, the right auricle and ventricle, as alſo the left auricle, are entirely filled with black Blood.

Motion in the Blood, muſt firſt take place in the left auricle and ventricle; what mechanic force, exerted by the Lungs, can compel this black Blood in the left auricle and ventricle, to move forward?

It is true, we are to endeavour to promote the *expanſion*, and *contraction* of the Lungs, but not with the view of *forcing* the Blood from the right to the left ventricle of the Heart, but that by the expanſion of the Lungs, a greater quantity of air may be applied to a greater quantity of Blood, to deprive that Blood of its phlogiſton, and to oblige it to receive, at the ſame time, the ſtimulus of heat, which ſtimulus it is in want of, and unleſs it is applied ſpeedily, the ſmall quantity or energy (or whatever term ſhould be made uſe of) of excitability, remaining in the Heart, will not be excited, the Heart will not renew its contractions; if we reſtore the loſt ſtimulus ſpeedily, the Heart will communicate motion to the Blood, by its contractions, ſenſation will return, and every thing go on as before, no injury being done to the machine. But, if we do not apply a ſtimulus, and ſuch a one as the remaining excitability of the Heart will be ſuſceptible of, we ſhall do no ſervice; if we could employ the ſtrength of Hercules, to the end of the world, we could not re-animate the machine, by reſtoring the living principle, which if reſtored to the higheſt degree, would not contract upon ſuch Blood as we might force into it; for the left auricle is full of Blood, yet cannot propel it.

Are we to entertain the idea, that the Blood is to be pumped out of the left ſide of the Heart, into the aortic ſyſtem? ſuch muſt be our idea, if we think of mechanic force, black Blood is propelled for a little while, by the left ſide of the Heart, but when reſpiration is ſuſpended, and the left auricle and ventricle, has ceaſed to contract upon phlogiſticated Blood, poſitive death will ſoon be the conſequence, unleſs we, without delay, ſet about imitating the

natural

natural function of the Lungs, and by doing that, cauſe the Blood to produce its accuſtomed ſtimulating effect, by altering its qualities, and not by the application of mechanic force, to compel it to move forward ; the firſt intention implies, that there is a living principle reſiding in the Heart, and which wants to be excited to contraction ; the latter gives the idea, that the Heart and arteries are dead elaſtic tubes, and which require the Blood to be forced through them ; or this idea transfers the ſeat of animal life from the Heart to the Lungs.

We have proved, that life is a forced ſtate of exiſtence, but we always kept in view the living principle, which cannot act, is conſtantly acted upon by foreign powers ; of theſe powers, air is a principal one, which produces its effect not mechanically, but chemically.

Supply the Blood with the uſual ſtimulus, if any excitability remains, the Heart will be ſuſceptible of the ſtimulus, will renew its contractions, and the Blood will be propelled into the arterial ſyſtem.*

This being the real ſtate of the caſe, it neceſſarily follows, the ſooner the black Blood is made to experience its uſual change in the Lungs, the better chance there is for the recovery of the patient; this change is to be effected by air; then with regard to air, we ſay, air from ſound Lungs, *bonus*, atmoſpheric air, *melior*, empyreal (or as Dr. Prieſtley calls it dephlogiſticated air) *optimus.*

Air, from ſound Lungs, is not ſo fit for the purpoſe, as atmoſpheric air, becauſe it has parted with a certain quantity of heat, and has taken into its compoſition, a certain quantity of the inflammable principle.

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* Dr. Fothergill obſerves, page 117, "it does not ſeem abſurd to compare the animal machine, to a clock, let the wheels whereof be in ever ſo good order, the mechaniſm complete in every part, and wound up to the full pitch, yet without ſome impulſe communicated to the pendulum, the whole continues motionleſs

Atmoſpheric air is generally found to contain two thirds of phlogiſticated air, one third empyreal air, and a very ſmall quantity of fixed air. In reſpiration, the quantity of empyreal air is diminiſhed, the quantity of fixed air is increaſed, the phlogiſticated remains the ſame, and we have found from Dr. Crawford's experiments, that the air loſes a part of its heat in the Lungs.

The heat contained in empyreal air, compared with the heat of atmoſpheric air, is, as 4.7490 to 1.7900, according to Dr. Crawford's experiments. It follows, that in caſes of apparent death, from ſubmerſion, &c. that if we inflate the Lungs with empyreal air, we ſhall produce nearly as great a change in the Blood, in the pulmonary veſſels by a ſingle inflation, as by three inflations with atmoſpheric air, therefore we cannot heſitate in giving pure air the preference, and Dr. Goodwin found by experiments, that pure air effected recovery much ſooner than common atmoſpheric air.

Atmoſpheric air communicates a ſtimulus to the Blood in the Lungs, in proportion to the quantity of pure air it contains; phlogiſticated air is not fit for reſpiration, the heat contained in common atmoſpheric air, compared with the heat in phlogiſticated air, is, by Dr. Crawford's experiments, as 1.7900 to .7936.

By that gentleman's experiments, it alſo appears, that the heat contained in arterial Blood, compared with the heat in venous Blood, is as 1.0300 to .8928.

If the left auricle and ventricle has been accuſtomed to a ſtimulus, equal to 1.0300; how can we expect they will contract upon the application of a ſtimulus only equal to .8928? a ſtimulus only equal to .8928, will produce no excitement, as we find is the caſe; is it not evidently our buſineſs to reſtore the loſt ſtimulus? and can we effect this too ſoon? will not empyreal air, as it contains nearly three times the degree of heat, that atmoſpheric air contains, execute our intention in one third of the time nearly? before this reaſoning can be overturned, Dr. Crawford's experiments muſt be invalidated, unleſs I have made any miſtake, which I cannot at this time detect. Dr. Crawford's experiments preſent us with a large fund of information, and they are held in ſuch high eſtimation, that concluſions fairly drawn from them, will reſt upon a very good foundation; we find by them, that heat is the exciting power, which the air communicates to the Blood in the Lungs, and that this power is applied only according to the neceſſity, and cannot be over applied. If heat is diminiſhed in its application to the ſurface of the body, a greater quantity of heat will be abſorbed from the air by the Blood in the Lungs; if a body is expoſed to a warm medium, leſs heat will be abſorbed from the air, becauſe leſs phlogiſton will be thrown off from the Blood, and it might be worth our while to enquire, whether food and drink, which we know ſtimulate according to their different qualities (leſs or more) effect this operation by other means, than by quantity and heat; but this inquiry is not neceſſary for our preſent purpoſe.

Sir Torbern Bergman, in his prefatory introduction to a work, by Mr. Scheele, member of the Royal Academy at Stockholm, entitled, "*Chemical Obſervations and Experiments on Air and Fire*," obſerves, "heat, fire, and light, are in regard to "the elementary principle the ſame with "good air, and phlogiſton, but their pro-"portion, and perhaps the manner of "their compoſition cauſe the great diffe-"rence; phlogiſton ſeems to be a real "elementary principle, which enters the "chief part of ſubſtances, and adheres to "them moſt obſtinately; there are ſeveral "means to ſeparate it more or leſs per-"fectly; of thoſe known ſubſtances, "good air is moſt active; for which reaſon, "I put its ſign at the very top of the "column of phlogiſton in my new table "of attractions; what it cannot do "ſuddenly, is however done, gradually,

" by the intervention of favourable cir-
" cumſtances."

Sir Torbern goes on by obſerving, " How intereſting the more refined che-" miſtry is, will not be neceſſary to prove " more circumſtantially on the preſent " occaſion. It requires a great deal of " prejudice, or the greateſt ignorance, to " treat it with contempt under the ſpeci-" ous pretence of unneceſſary refinement " and ſubtleties. EARTH, WATER, AIR, " HEAT, LIGHT, and many more ſuch " ſubtle ſubſtances are every where to be " met with; and as long as their proper-" ties remain unknown, the effects, both " of nature and art, muſt remain involved " in the moſt perfect obſcurity. In che-" miſtry there are none of the *veritates* " *otioſæ*, the leaſt phænomenon, when " examined in all its cauſes, is always " connected with others of the greateſt im-" portance, in ſuch a manner, that every " thing is ſhewn connected in the great " œconomy of nature."

The foreign exciting powers, neceſſary to be applied to an animal body for the purpoſe of ſupporting life, all act by a ſtimulating operation, more or leſs, (whether that operation is effected by other means, than by diſtention, and heat, we ſhall not at preſent enquire) how extremely cautious ought we to be in applying them, if we wiſh to continue in that ſtation where HEALTH takes her poſt; the leaſt exceſs or deficiency of ſtimulus, neceſſarily places us in one of the two ſtates of *prediſpoſition*; but this is of no conſequence to thoſe who know the tenure on which they enjoy life, they will know how to remedy the inconvenience, but thoſe who know not any thing of the matter, will remain in one of the two ſtates of *prediſpoſition*, and will continue to increaſe the prediſpoſition, by an injudicious application of the foreign powers, will miſtake effects for cauſes, will direct their attention to effects, will aſſiſt nature as they think, by bleeding in caſes of bleeding diſcharges, vomiting in caſes of vomiting, &c. till diſeaſe is actually eſtabliſhed, which in ſuch hands muſt be incurable.

The common ſupports of life, by being injudiciouſly applied, prediſpoſe to diſeaſes of one of the two claſſes, *viz.* STHENIC or ASTHENIC.

But it is not apparent, that the ſtimulus of heat, which pure air communicates to the Blood in its circulation through the Lungs, can be carried to exceſs, as the other foreign powers often are, ſo as to occaſion ſthenic diatheſis, for that the degree of heat which is applied, is entirely governed by the quantity of phlogiſton ſeparated from the Blood, and this ſeparation of phlogiſton and acquiſition of heat, will always be equal to the neceſſity, *if we allow a ſufficient quantity of empyreal air to be reſpired.**

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* Mr. Lavoiſier calcined metals under a glaſs receiver, by means of a burning glaſs, and they were deprived of their phlogiſton only in a certain quantity of air; i. e. in proportion to the *empyreal air*, contained under the receiver ſo

Experience proves, that perſons who reſide in the country, and uſe exerciſe, and by that means, reſpire a far greater quantity of a much purer air than we do in town, by making uſe of a regimen of too ſtimulating a nature, become obnoxious to inflammatory diſeaſes, from *exceſſive* excitement.

On the contrary, every man's experience will immediately point out to him, that thoſe perſons who live ſedentary lives in town (and a very large proportion of the inhabitants come within this deſcription) do not make uſe of food and drink in quantity or quality ſufficiently ſtimulating, take in a leſs quantity of air, and that air not ſo proper for reſpiration as the air of the country, will be expoſed to diſeaſes originating in *diminiſhed excitement, and the conſequent retention of phlogiſton, viz.* ASTHENIC DISEASES.

A ſufficient

ſo much and no more phlogiſton, could be ſeparated from the metals, the air remaining under the receiver being foul air.

A ſufficient quantity of pure air will not be reſpired, the Blood under ſuch circumſtances will not be ſufficiently dephlogiſticated, it will of courſe become leſs ſtimulating, a languid circulation will be the conſequence, the function of the different organs, will be incomplete, and in this way I apprehend one or other of the aſthenic diſeaſes will be produced, and which has been found to be induced by a *debilitating cauſe.*

I cannot avoid taking notice of a mode of expreſſion, pretty generally in uſe with medical men, and by which a very falſe idea is inculcated; it is this, a debilitating mode of treatment, neceſſary to be had recourſe to, when neceſſity requires ſthenic diatheſis to be taken down, and which conſiſts in bleeding, purging, vomiting, &c. we call *antiphlogiſtic*, as if ſthenic diſeaſes proceeded from a retention of *phlogiſton*, when the reverſe of this comes neareſt the truth.

If we wiſh to preſerve health, by having he Blood ſufficiently dephlogiſticated in own, and with making uſe of but little xerciſe for that purpoſe, in order to pre-ent the neceſſity of making a viſit in the ountry, leaving our concerns in town to he management of others, and incuring an xpence, which many of us can ill afford. We muſt endeavour to ſupply the defect of the ſtimulus of heat derived from the ir in reſpiration from other ſources.

Conſequently we muſt take care to keep up a proper degree of heat externally, by means of good cloathing and fire, and by making uſe of articles of food and drink, that will afford a proper degree of excitement.

By properly having recourſe to theſe ſtimulants, properly I ſay, becauſe no general rule can be given in this caſe, every man ought to exerciſe his own judgement in this reſpect, a mode of living abſolutely neceſſary for ſome people to make uſe of to keep off debility from a diminution of excitement, would, if followed by others, give riſe to debility from exceſſive excitement; this ſpecies of debility, Dr. Brown calls *indirect*, by way of contraſting it with the other ſpecies, which is occaſioned by diminiſhed excitement, and to which he applies the term, *direct*.

I ſhould be very ſorry to be eſteemed a friend to *intemperance*, it cannot be our intention in pointing out the way by which mankind may better preſerve health in large towns, and keep off diſeaſes ariſing from inſufficiency of the ſtimulant operation of heat; to recommend exceſs, conſequently expoſe them to diſeaſes from exceſſive excitement, and ultimately bring on *indirect debility, which cannot fail to put an early period to this forced ſtate of animal life.*

But by keeping within that ſtation or boundary, which TEMPERANCE preſcribes, and at the ſame time granting ourſelves a proper latitude, the Blood will not be ſo much impregnated with the principle of inflammability, as it would, if we half ſtarved ourſelves, and a leſs quantity of air will ſuffice for the purpoſe of dephlogiſticating the Blood by attracting the inflammable principle. See Dr. Crawford's fourth propoſition.

If the phlogiſton is not completely ſeparated from the Blood in the Lungs, by the application of a ſufficient quantity of pure air, (and the leſs heat the Blood derives from other ſources, the greater will be the quantity of phlogiſton to be ſeparated from it in the Lungs, and of courſe a greater quantity of air will be neceſſary to be reſpired in a given time) the contractions of the Heart will not be ſo perfect as they ought, a languid circulation will enſue, the functions of the different organs, as was before obſerved, will be imperfectly performed, and one or other of the *aſthenic diſeaſes*, will inevitably follow.

To return to the ſubject of apparent death from ſubmerſion, &c. we have found, that the Blood in the pulmonary veſſels, the auricles and ventricles is loaded with phlogiſton.

This phlogiſton muſt be ſeparated from, and heat communicated to the Blood, before the Heart can renew its contractions, and by contracting, communicate motion to the Blood, we have alſo found, from the experiments of Dr. CRAWFORD, Dr. GOODWIN, and SIR TORBERN BERGMAN, that empyreal air will dephlogiſticate the Blood, in far leſs time than any other air; empyreal air we conſider then as the great deſideratum.*

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* Electricity cannot be employed with equal advantage in theſe caſes, as in ſome others, where a powerful ſtimulus is required. Where is the uſe of producing a few contractions, by having recourſe to electricity; electricity has not a tendency to reſtore to the Heart its natural ſtimulus by dephlogiſticating the blood; it is clearly our buſineſs, to employ ſuch means, as will cauſe the natural ſtimulus to be applied the ſooneſt, and to take care that its application ſhall not be interrupted. By doing this we ſhall produce, not momentary effects, but ſuch as will be permanent, unleſs the principle of vitality, reſiding in the Heart, is ſo far

As a bellows is to be found in every houſe, by inflating the Lungs as ſoon as poſſible with common air, with them, and the proper application of heat, externally, many lives may be preſerved under theſe unfortunate circumſtances.

Air blown into the mouth, from the Lungs of another perſon, is not ſo good for the purpoſe as common atmoſpheric air, or can it be blown in with ſufficient force, or in a ſufficient quantity to come in contact with a large ſurface of Blood; if air does not penetrate into the remote cells of the Lungs, ſo as to change the quality of the Blood in the trunks of the pulmonary veins and left auricle, it will not be ſo likely to produce the intended effect

And

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far deſtroyed, as not to be ſuſceptible of the uſual ſtimulant operation of the Blood; if this is the caſe, the unfortunate perſon may be ſaid to be irrecoverable, and if a few contractions ſhould be obſerved from the application of electricity, three or four hours afterwards, it does not appear to me, that the patient is in a recoverable ſtate.

And if it ſhould happen, that the ſmall branches of the trachea, contain water, the water will occupy thoſe places where air is principally required, and inflation will prove ineffectual, therefore it is abſolutely neceſſary, that where there is water, it ſhould be evacuated, previous to the introduction of air; ſome of the water if the Head is reclined below the horizontal line, will eſcape out of the mouth by its gravity, but we cannot conclude that the water, which makes its way by the mouth, came from the Lungs, for it may come from the ſtomach.

From the experiments of Dr. Goodwin, it appears, that only a ſmall quantity of water enters the Lungs, when an animal is immerſed in that fluid, and that this ſmall quantity paſſes into the trachea during efforts to inſpire, and not from the operation of the principle of gravity; however if there is water in the cavities of the Lungs, it will counteract our intention, the unfortunate perſon will not be recovered unleſs the water can be removed.

Doctor Goodwin has been favoured by Dr. Nooth, with a very ingenious inſtrument, the Doctor gives a plate and a deſcription of it; it appears to be well worth the attention of medical men; it is intended to extract water, if water is preſent, and it will inflate the Lungs with a given quantity of air, neceſſary to be thrown into that Organ at each inflation, viz. one-hundred cubic inches.

By this inſtrument, an hundred cubic inches of air may be introduced into the Lungs at each inflation, which is to be drawn out again before more is introduced; if an hundred cubic inches, or whatever is the quantity of air neceſſary to diſtend the more remote cells, in order that the Blood in the trunks of the pulmonary veins, and left auricle ſhould be expoſed to its action, it is right that the determined quantity ſhould be meaſured, for if only half the quantity is forced in, it will not penetrate to thoſe parts where its preſence is moſt wanted.

Having found an inſtrument, that will extract water from the Lungs, and that will inflate that organ with a meaſured quantity of air; the next thing to enquire after is, a convenient portable apparatus to ſupply this inſtrument with empyreal air, and I am well ſatisfied, that we ſhall not long be in want of ſuch an apparatus, if my readers are of opinion with me, that it will prove of great public utility, for I do not ſee obſtacles in the way, that may not be ſurmounted by ingenuity.

An inſtrument, that will produce the above effects, and an apparatus, that will ſupply it with empyreal air, without interruption, are things of the firſt importance in the reſuſcitating art. For them, I would give in exchange, the whole catalogue of inſtruments and remedies, that has ever been made uſe of for the recovery of perſons apparently dead, after ſubmerſion, ſtrangulation, noxious air, &c.

Mr. Forſter the tranſlator of a work, from the German, wrote by Mr. Scheele, entitled, “ *Chemical Obſervations and Experiments on Air, and Fire,*” in his note obſerves, “ John Mayow, in his *Opera Omnia, Medico-phyſicâ, Hagæ,* 1681, 8vo. has already given ſome obſcure hints about that part of our common atmoſpherical air, which properly ſpeaking is the moſt proper for reſpiration, or in which the flame of a candle will burn longer, than in the ſame bulk of our mixed common air; this conſtituent part of our common air, Dr. PRIESTLEY has called *dephlogiſticated air*, and Mr. Scheele, *empyreal air*; it is eaſily produced, Mr. Forſter ſays, by heating red lead, moiſtened with ſpirit of nitre, and Dr. Prieſtley obſerves, “ that dephlogiſticated air, is a compound of ſpirit of nitre and earth.” (See “ *Experiments and Obſervations on air,*” Vol. II, p. 54, 55, 62, 63, Vol. III, p. 41.)

Mr. Scheele, in page 46 ſays, he thinks the following is the beſt and cheapeſt method of obtaining *empyreal air*.

EXPE-

EXPERIMENT.

“ I put one ounce of ſalt-petre purified
“ for diſtilling, into a glaſs retort and
“ employed a moiſtened bladder, emptied
“ of air, in lieu of a receiver. As ſoon as
“ the ſalt-petre became red hot, it began
“ boiling, and at that period of time the
“ bladder was expanded from the air that
“ paſſed over; I continued the diſtillation,
“ till the boiling in the retort ceaſed, and
“ the ſalt-petre was on the point of
“ penetrating through the ſoftened glaſs
“ retort. In the bladder, I found the pure
“ *empyreal air*, taking up the ſpace of
“ fifty ounces meaſure.”

By this experiment we ſee that one ounce of ſalt-petre will produce fifty ounces of empyreal air by meaſure, a pound of ſalt-petre, will then produce eight hundred ounces of the ſame kind of air, the expence of preparing a ſufficient quantity of empyreal air, to be made uſe of in accidents of the kind, we have been treating of, will be very trifling, a few pounds of a very cheap article, will anſwer the purpoſe; but we want a convenient portable apparatus for preparing this air, and to conduct it without interruption, into the cylinder of ſuch an inflating inſtrument as Dr. Goodwin's appears to be, which will contain one-hundred cubic inches of air; this cylinder, which is braſs, communicates with the atmoſphere, by a ſmall circular opening, at equal diſtances from top and bottom, one end of an elaſtic tube, ſhould be made ſo as exactly to fill up this circular opening, while the other as exactly fitted the orifice of a retort, or whatever is made uſe of for boiling the nitre.

I ſhall extract one of Mr. Kirwan's notes, which the reader will find added to Mr. Scheele's work on *air and fire*, and conclude theſe obſervations.

Page 243, "The reciprocal effects of
" AIR and BLOOD on each other, have
" been happily aſcertained by Dr. PRIESTLEY,
" in the third volume of his obſer-
" vations, he has there ſhewn that red
" Blood, is freer from phlogiſton, than
" black Blood; that the former dephlo-
" giſticates in ſome meaſure, nitrous,
" inflammable, phlogiſticated, and fixed
" air, and then becomes black; that the
" latter phlogiſticates common and dephlo-
" giſticated air, and then becomes red,
" *particularly when the latter of theſe airs*
" *is uſed, and hence inferred the true uſe of*
" *reſpiration to conſiſt in the dephlogiſtication*
" *of Blood, which he proved that air could*
" *effect, even through the membranes of the*
" *Lungs, and through ſerum,* a diſcovery
" of the greateſt importance to medicine,
" as well as to the general ſcience of
" nature."

FROM THE

Edinburgh Medical Commentaries,

For the Year 1789, page 413.

The Humane Society of London, have lately publiſhed and diſtributed the following directions for the recovery of the apparently dead by drowning, and the various kinds of ſuffocation.

FIRST, The reſtoration of heat is of the greateſt conſequence to the return of life, when therefore the body is taken out of the water, the clothes ſhould be ſtripped off, or if naked at the time of the accident, it muſt be covered with two or three coats, or a blanket, or any thing anſwering the purpoſe, that can be moſt eaſily procured. The body ſhould then be carefully conveyed to the neareſt houſe, with the head a little raiſed. In cold and damp weather the unfortunate perſon ſhould be laid on a bed, and in a room that is moderately heated, in ſummer on a bed expoſed to the rays of the ſun, with the windows open, and not more than ſix perſons admitted, a greater number may retard the return of life. The body is to be well dried with warm cloths, and gently rubbed with flannels ſprinkled with rum, brandy, gin, or muſtard; fomentations of either of theſe ſpirits, may be applied to the pit of the ſtomach with advantage. A warming-pan, covered with flannel, ſhould be lightly moved up an down the back; bladders and bottles fille with hot water, heated bricks or tile wrapt up in flannel, ſhould be applied tc the ſoles of the feet, palms of the hands, and other parts of the body.

Secondly, Reſpiration will be greatly promoted by cloſing the mouth and one noſtril, while with the pipe of a bellows, you blow into the other with ſufficient force to inflate the Lungs; another perſon ſhould then preſs the cheſt gently with his hands, ſo as to expel the air. Thus the natural breathing will be imitated; if the pipe be too large for the noſtrils, the air may be blown in at the mouth. Blowing the breath can only be recommended when bellows cannot be procured.

Thirdly, The bowels ſhould be very ſoon inflated with the fumes of tobacco, and repeated three or four times within the firſt hour; but if circumſtances prevent the uſe of this vapour, then clyſters of this herb, or other acrid infuſions with ſalt, may be thrown up with advantage. The fumigating machine is ſo much improved, as to be of the higheſt importance to the public, and if employed in every inſtance of apparent death, it would reſtore the lives of many of our fellow creatures, as it now anſwers the important purpoſes of fumigation, inſpiration, and expiration.

Fourthly, Agitation has proved a powerful auxiliary to the other means of recovery. One or more of the aſſiſtants ſhould therefore take hold of the legs and arms, particularly of boys, and ſhake their bodies for five or ſix minutes; this may be repeated ſeveral times within the firſt hour; when the body is wiped perfectly dry, it ſhould be placed in bed, between two healthy perſons, and the friction chiefly directed in this caſe to the left ſide, where it will be moſt likely to excite the motion of the heart.

Fifthly, When theſe methods have been employed for an hour, if any brew-houſe, bake-houſe, or glaſs-houſe be near, where warm grains, aſhes, lees, &c. can be procured, the body ſhould be placed in any of theſe, moderated to a degree of heat, very little exceeding that of a perſon in health. If the warm bath can be conveniently obtained, it may be advantageouſly uſed in conjunction with the earlieſt modes of treatment.

Sixthly, Electricity ſhould be very ſoon employed, as it will increaſe the beneficial effects of other means of recovery on the ſyſtem, "the electrical ſhock," ſays Mr. Kite, in his Eſſay on the Recovery of the apparently Dead, is to be admitted as the teſt or diſcriminating characteriſtic of any remains of animal life, and ſo long as that produces contractions, may the perſon be ſaid to be in a recoverable ſtate, but when that effect has ceaſed, there can no doubt remain of the party being abſolutely and poſitively dead."

Seventhly, If ſighing, gaſping, convulſions, or other ſigns of returning life appear, a tea ſpoonful or two of warm water may be put into the mouth, and if the power of ſwallowing be returned, a little warm wine, or brandy and water may be advantageouſly given; when this gradual approach towards recovery is obſerved, and breathing and ſenſibility returned, let the perſon be put into a warm bed, and if diſpoſed to ſleep, as is generally the caſe, give no diſturbance, and he will awake after a ſhort time, almoſt perfectly recovered.

The above methods are to be uſed with vigour for three or four hours, for it is a vulgar, and dangerous opinion to ſuppoſe perſons are irrecoverable becauſe life does not ſoon make its appearance, an opinion that has conſigned an immenſe number of the ſeemingly dead to the grave, who might have been reſtored to life by reſolution and perſeverance.

Bleeding ſhould never be employed in ſuch caſes, unleſs by the direction of one of the medical aſſiſtants, or ſome other reſpectable gentleman of the faculty, who has paid attention to the ſubject of ſuſpended animation.

On the firſt alarm of any perſon being drowned, or accidentally ſuffocated; let hot water, flour of muſtard, warm blankets, hot flannels, flat bottles filled with hot water, a heated warming pan, bellows, brandy, hartſhorn drops, and an electrifying machine be inſtantly procured; theſe articles being in readineſs, and immediately employed, may be the means of reſtoring many uſeful and valuable lives.

The common people will often reſtore life by purſuing the plans now recommended; but if gentlemen of the Faculty can be obtained, their aſſiſtance ſhould be immediately requeſted, as their ſkill will lead them judiciouſly to vary the methods of treatment. And, in a variety of accidents, many more lives will be reſtored to the community and their families.

FINIS.

A

DISSERTATION

ON

USPENDED RESPIRATION.

A

DISSERTATION

ON

SUSPENDED RESPIRATION,

FROM

Drowning, Hanging, and Suffocation:

In which is recommended a different Mode of Treatment
to any hitherto pointed out.

By EDWARD COLEMAN, Surgeon.

"Qui ſtudet optatam curſu contingere metam,
"Multa tulit fecitque puer."

Hor.

LONDON:
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MDCCXCI.

DEDICATION.

To HENRY CLINE, *Eſq;*

LECTURER ON ANATOMY, AND SURGEON TO ST. THOMAS'S HOSPITAL.

DEAR SIR,

THAT diſtinguiſhed eminence you have ſo deſervedly attained in the medical world, and that gratitude, you might ſo juſtly claim from all your pupils, particularly from one who is indebted for his chirurgical and phyſiological knowledge, not only to your public, but private inſtructions;

ſtructions; would, alone prove ſufficient inducements for me to addreſs theſe firſt fruits of my profeſſional ſtudies to you.

But however powerful theſe motives; allow me to add, there is another yet more cogent, and which flows more immediately from the heart.

That friendſhip with which you honoured me while reſident under your roof, and which you have kindly continued ſince I quitted that hoſpitable manſion, to enter the buſy ſcenes of life; will for ever live in my recollection, and awake the moſt grateful emotions of a feeling mind.

Permit me then to hope you will receive this Dedication as a ſmall, but ſincere teſtimony of that ſenſe I entertain of your eſteem; to merit and to enjoy which, to the lateſt period of my exiſtence, is the higheſt ambition of,

Dear Sir,

your much obliged

and moſt humble ſervant,

EDWARD COLEMAN.

No. 8. Fen-court,
Fenchurch street.

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ERRATA.

Introduction, pa. x. line 12. after *diſcovered*, read *to depend on.*
Page 2. line 8. for *progreſs*, read *proceſs.*
6. line 15. after *ſecured*, read *by ligature.*
21. in the note, after *bulk*, read *as is.*
37. line 18. for *by warmth*, read *in warmth.*
40. line 12. for *bronchial veſſels*, read *bronchial arteries.*
62. line 16. after *Goodwyn* begin a freſh period.
90. line 3. after *irritability*, ſupply *be.*
113. line 53. for *ſpirits of nitre*, read *nitrous acid.*
218. line 1. for *a leſs degree*, read *a more gradual one.*

INTRODUCTION.

OF all the exertions of human ſkill, there is, perhaps, none which affords us more ſolid and laſting gratification, than the reſtoring to life thoſe who are apparently dead; none, ſurely, more eminently ſhews the dignity and fruitfulneſs of Philoſophy, or more clearly evinces the benefits that may be derived from the well-directed efforts of human underſtanding.

This art (if ſuch it might be called in ſo rude a condition) was, in former ages, guided chiefly by blind prejudice; the knowledge of the animal œconomy, and of life, was not ſufficiently extended, to afford maxims of any value to the practitioner;

titioner; and the cauſes of death were too incorrectly marked, to ſhew, with any degree of preciſion, the means of recovery.

Accidental recoveries had, indeed, ſhewn that it was practicable; but Phyſiological ſcience was unable to explain or preſcribe the mode. It was reſerved for the eighteenth century, to exhibit, on a large ſcale, any practical ſpecimens of this mode of benevolence, and to approach, in ſome reſpect, to the ſcientific ſolution of thoſe principles by which it muſt be guided. Many ſocieties were formed on the continent of Europe, for the purpoſe of promoting this kind of knowledge; and their reports afforded the moſt mortifying reply to thoſe who had declaimed with ſuch triumph on the vanity of natural ſcience, and the impotence of human art. Their multiplied ſucceſſes, in ſo untried a path, awakened a general ardour on this ſubject, which was not a little foſtered by a cotemporary revolution in natural knowledge: I allude to the philoſophy of elaſtic fluids, which has, during the laſt part of the preſent century, received ſuch incredible acceſſions. The doctrine of *airs* was ſo intimately connected with the ſubject of reſpiration, that it could not fail to fix the attention of Philoſophers on thoſe caſes where its ſudden ſuſpenſion was the cauſe of death. It were ſuperfluous to enumerate the various theories offered by the Chymiſts and Phyſiologiſts of this recent period. Suffice it to remark, that the Humane Society of London deemed the ſubject ſo perplexed with diſcordant theories, and ſo ſuſceptible of farther experimental elucidation, that they publiſhed, in 1787, a queſtion on *the nature of the diſeaſes produced by ſubmerſion, ſuſpenſion, and noxious airs.* Two Differtations, of peculiar merit, they honoured with prizes: thoſe of Dr. Goodwyn and Mr. Kite. The ſame enlightened and benevolent body purſued this enquiry, by propoſing a queſtion—"*Whether Emetics,* "*Veneſection, or Electricity, be proper in* "*ſuſpended Animation, and under what* "*Circumſtances?*"

To this queſtion, I am about, in the following Diſſertation, to attempt an anſwer. It may be thought, that, as this queſtion is purely *practical,* any inveſtigation of the *proximate cauſe* of the malady, is ſuperfluous and impertinent, and that our views ought to be limited to the remedies employed in its cure; or, it may perhaps be ſuppoſed, that ſuch enquiry is precluded by the ſucceſsful labours of Dr. Goodwyn and Mr. Kite: but reaſon, which forbids us to abandon any thing ſo important, to blind empiriciſm; the example of theſe Gentlemen, who had from their pathology deduced their cure, and the repugnance of their inferences to each other, which countenanced a doubt reſpecting the accuracy of either,—ſeemed to prove the neceſſity of reinveſtigating, by experiment, the nature and cauſes of the diſeaſe, previous to the delineation of any plan of cure. One of theſe Gentlemen attributes death in theſe caſes to the quality of the blood in the left ſide of the heart, which has not received from the air, that ſtimulant power which ſupports the action of that organ. The other attributes it to apoplexy. I was induced, ſince the appearance of theſe eſſays, to attempt a ſeries of experiments on the ſubject, which perhaps I ſhould not have cultivated with ſo much ardour, had I not been animated by the example of Mr. Kite, from whom I received the rudiments of my medical education, and for whom, in combating his opinions, I truſt I ſhall not be deficient in that reſpect which his talents demand. Theſe experiments preſented reſults which contradicted, in many important particulars, received opinions: but I ſhould not, at ſo early a period of my life, have preſumed to offer them to the public, had I not been emboldened by the approbation of the Medical Society of London, who voted me the Humane Society's Medal. To Mr. Kite, I flatter myſelf, no apology for the freedom of my ſtrictures on his opinions, will be neceſſary. Not to have noticed his work, would have been diſreſpectful; and to have diſſembled what I found to be truth, in tenderneſs to his ſentiments, is, I am ſure, a ſacrifice that his liberality would not exact. He is acquainted with my experiments and concluſions, and has, I apprehend, in conſequence, changed ſome opinions, which, in the hurry of enquiry, he had precipitately adopted.

Dr. Goodwyn has juſtly and ingeniouſly remarked, that the expreſſion, " Suſpended " Animation," is objectionable. Reſpiration and circulation may be ſuſpended; but the principle of life, or the ſuſceptibility of action, which is the ſource of theſe functions, may ſtill remain. Life, therefore, can with no propriety be ſaid to be ſuſpended, when the vital principle is preſent. The animal muſt either retain the principle of life, or be abſolutely and irrecoverably dead. There is no intermediate ſtate between life and death. The diſtinction between the actions and powers of life, which, with ſo many other admirable obſervations in Phyſiology, we owe to the ingenious Mr. Hunter, clearly illuſtrates the impropriety of the language to which we object. He has proved that in many caſes, theſe powers remain when the actions are ſuſpended. The preſence of theſe powers alone conſtitute life, and form the ſole diſtinction between inanimate and animated matter. When they ceaſe to be preſent, life is *not ſuſpended, but deſtroyed.* Inſtead therefore of employing the term Suſpended Animation, we ſhall adopt that of *ſuſpended reſpiration*, which only ſimply expreſſes a fact, and is equally applicable to thoſe caſes which terminate in death, as to thoſe of which the event is favourable.

The neceſſity of inflicting a painful death on ſo many animals will ever be felt by minds of ſenſibility, as a cruel alloy to the pleaſure of Phyſiological reſearch. By no other mode, however, than that of experiments on living animals, can any important advance be made in this ſubject. Such experiments, in a queſtion of mere curioſity, are certainly indefenſible; but where, as in the preſent caſe, the advancement of truth conſpires with the intereſts of humanity, we muſt impoſe ſilence for a while on the remonſtrances of ſenſibility.

In the conduct of the experiments which form the baſis of the following diſſertation the moſt ſolicitous accuracy has been every where ſtudiouſly ſought.

To thoſe who are in the habits of Phyſiological experiment, nothing is more familiar than the perplexing variety and repugnance of their reſults; two experiments, though made in the ſame manner on the ſame order of animals, will rarely in every particular agree; for it is not only true, that different ſpecies of animals, but that different individuals of the ſame ſpecies, poſſeſs various degrees of irritability. In ſome, irritability may be excited for ſeveral hours after apparent death, others loſe it in leſs than one. The cauſe, however, of theſe variations, where they have been in any reſpect conſiderable, we have generally diſcovered ſome accidental and extrinſic circumſtance, and by multiplying and varying experiment, we have attempted to diſcriminate between what is made the foundation of *general* principles, and what is the effect of peculiar and fortuitous circumſtances. But the enthuſiaſm which we acquire in the purſuit of a favourite reſearch, and our anxiety to ſupport a cheriſhed opinion, ought ever to make the experimental enquirer diffident of the correctneſs and impartiality of his *own* views. A bias unconſciouſly taints his judgment, againſt which the only remedy is, the vigilant eye of acute and intelligent friends, who feel more anxiety for his reputation, than tenderneſs for his prejudices; and who have no motives either to make tortured inferences, or to hide unfavourable reſults.

The ſame good fortune that has bleſſed my private life with the friendſhip of ſuch men, I have alſo eminently felt in my ſcientific purſuits. Their acuteneſs has reſcued me from my prejudices; and their aid has given me a confidence in the correctneſs of the experiments, which diſtruſt in my own individual ſkill would otherwiſe never have permitted me to entertain. I have to mention with particular gratitude, Mr. Aſtley Cooper, whoſe anatomical and phyſiological knowledge needs no comment; and Mr. Keir, a gentleman of diſtinguiſhed ingenuity, who favoured me with his occaſional aſſiſtance. And it affords me no ſmall gratification, that my much reſpected friend Mr. Haighton, Teacher of Phyſiology, in the Borough, has made many experiments which corroborate moſt of the opinions here advanced.

Though ſubmerſion be the moſt frequent, it is by no means the only caſe of apparent death worthy the inquiry of the Phyſiologiſt, or the attention of the medical practitioner. Nor is the benevolent zeal of the Humane Society confined to it alone; as every caſe of apparent death ariſing from a ſudden ſuſpenſion of reſpiration, partakes equally of its bounty;

and indeed, agreeable to this extenſive view of the ſubject, the queſtion before us is propoſed.

The ſuſpenſion of vital action from ſtrangulation and noxious airs, exhibit phenomena ſo nearly ſimilar, and require a treatment ſo ſtrictly congenial, that any inquiry into the nature of ſubmerſion, would be narrow and imperfect, unleſs illuſtrated by the inveſtigation of theſe kindred diſeaſes. To them, therefore, we have thought it expedient to extend our reſearches; and from inductions founded on a ſeries of experiments and obſervations on theſe different modes of death, we flatter ourſelves with the hope of having eſtabliſhed a general doctrine on premiſes leſs ambiguous and unſtable, than thoſe which have been the baſis of former theories.

To aſcertain phœnomena is the firſt duty of every inquirer into nature. We ſhall therefore, in the three firſt ſections, ſuccinctly deſcribe the uſual effects of drowning, hanging, and noxious airs. Having ſtated theſe, it will be natural to preface any enquiry into the nature of the diſeaſe, by the Phyſiology of the organs which are its ſeat; thus delineating their natural actions, before we examine their morbid condition. The Phyſiology of the heart and lungs therefore will conſtitute our fourth ſection.

Having deſcribed the phœnomena of departing life, the appearances on diſſection, and the natural ſtate of the organs concerned; we are next led to view the ſubject in a Pathological light, and to conſider that peculiar condition of the animal which forms the *proximate cauſe* of the diſeaſe. This will occupy the fifth ſection.

The remaining part, to which the preceding ſections are but preliminary, will be devoted to the conſideration of the cure: and in order to inveſtigate more at length, the efficacy of thoſe means which have been either ſuggeſted by ſpeculation, or ſanctioned by experience, we ſhall dedicate a ſection to each claſs; by which we ſhall be enabled to form a juſt eſtimate of their comparative efficacy and importance.

Emetics, Veneſection, Electricity alone, or combined with artificial Reſpiration, Warmth, Frictions, and Clyſters will be fairly examined by the teſts of experiment, and of reaſon; and our laſt ſection will conſiſt of concluſions drawn from the whole.

SECTION I.

On the common Effects of Drowning.

THE general effects of ſubmerſion have been deſcribed by others; and the reſult of our obſervations will be found nearly ſimilar to that obtained by thoſe who have already written on this ſubject. But, as it was neceſſary firſt to examine the appearances of animals under that circumſtance, before any clear idea could be formed of the proximate cauſe of the diſeaſe, we ſhall begin with a deſcription of the viſible effects that uſually ariſe from drowning.

As ſoon as an animal is immerſed in water, air is expelled from its lungs, and immediate attempts are made, apparently with great difficulty, to inſpire; in which a ſmall quantity of water is taken in. The animal betrays increaſing uneaſineſs; again expels air, and takes in water. The duration of this progreſs varies from one minute to four; when the muſcles of reſpiration ceaſe to act, and all ſtruggling is at an end. Some involuntary motions, however, generally ſucceed. On opening the cheſt, we find the two *venæ* cavæ, right ſinus venoſus, auricle, ventricle and pulmonary artery, loaded with blood; the left auricle nearly diſtended; the left ventricle about half; the aorta and its branches containing a quantity of blood, which, in all its appearances, reſembles venous. The lungs are diſcovered in a ſtate of collapſe, containing a ſmall quantity of water, in the form of froth, but very trifling, when compared to the quantity of air expelled from the lungs, during the act of drowning. The ſtomach, on examination, preſents alſo a little water, which probably paſſed into the œſophagus when the rima glottidis was cloſed by the epiglottis; for, as the water contained in the mouth is then refuſed admittance into the trachea, it ſhould ſeem, that, at that moment, it makes its way into the ſtomach; ſo that, as ſoon as the animal attempts to inſpire, water enters the trachea; but this organ, as if conſcious of not receiving its due element, rejects the water, which is then allowed to paſs into the œſophagus. Air is again emitted, and new efforts made to inſpire, when, upon the ſame ſenſation being produced, ſimilar effects ariſe; and, after the laſt expiration, no more water enters the lungs, or ſtomach. If it were not certain, that the epiglottis cloſed the rima glottidis as ſoon as the trachea was irritated, there would be found as much water in the lungs as the animal had expelled air; and if the ſtomach or lungs continued to admit water after reſpiration had ceaſed, we ſhould find them fully diſtended, where the animal was ſuffered to remain in water: but, whether our examination be made immediately after the ceaſing of reſpiration, or after the ſpace of ſeveral minutes, we find no variation in the quantity.

Mr. Kite has concluded, from his experiments, that no water enters the windpipe, until the animal is dead: but the entire reſult of our experiments, tends to prove the contrary; that water does get into the lungs, during the act of drowning, and that no animal, provided with lungs, can be drowned without this circumſtance taking place. Indeed Dr. Goodwyn has proved this to be the fact, in a manner ſo convincing and ſatisfactory, that we need only mention, that the whole of our experiments to aſcertain this point, have uniformly agreed with his.

It has been mentioned by Dr. Goodwyn, and other Phyſiologiſts, that the right auricle and ventricle are found FULL; but there ſeems to be ſome degree of impropriety in the expreſſion, for by the term FULL is generally underſtood, a *cavity replete without vacuity*; and if ſo, the left ventricle may be ſaid to be *full* when diſtended only to half its natural ſize, as it adapts itſelf to the volume of blood it contains, and in proportion as the quantity encreaſes, the cavity enlarges, until it attains a certain degree of diſtention, when it re-acts. If the heart, therefore, contain but a ſmall quantity of blood, the ſides of the auricle or ventricle will be in contact with it, and the cavity be thus obliterated. Hence we prefer the term *diſtention* to that of *fullneſs*.

The following experiments were made with a view to determine the exact proportion which the quantity of blood contained in the right ſide of the heart, bears to that in the left, after drowning.

EXPERIMENT I.

A Cat was drowned, and as ſoon as the uſual ſtruggles attending ſubmerſion had ceaſed, the cheſt was opened, the two cavæ, pulmonary artery and aorta were ſecured, and the blood contained in the heart carefully collected; upon which we found the proportions of the right to the left to be as 12 to 7.

The next experiment was made to aſcertain whether after the action of the heart had ceaſed, the proportions were altered.

EXPERIMENT II.

A Cat was drowned, and when the heart had ceaſed to vibrate, the two cavæ, pulmonary artery, and aorta were ſecured as before. The proportions of the right were to the left as 2 to 1.

Theſe experiments were repeated, and the quantities varied; ſometimes being as 7 to 4, at other times as 5 to 2, or as 12 to 7. So that at a medium, the proportions of the right are to the left, as about $3\frac{2}{8}$ to $1\frac{6}{8}$. The lungs were uniformly in a ſtate of collapſe.

Dr. Goodwyn has made ſome experiments to aſcertain the preciſe quantity of air contained in the lungs after death, and they were conducted in the following manner.

" A dead body of ordinary ſtature
" was procured, and a cloſe compreſs ap-
" plied upon the ſuperior part of the ab-
" domen to fix the diaphragm in its
" ſituation; a ſmall opening was then made
" into the cavity of the thorax on each
" ſide, and upon the moſt elevated parts.
" The lungs immediately collapſed, and
" water was introduced at theſe openings,
" till the cavity was filled. The volume
" of the water contained was 272 cubic
" inches.

" The perſon on whoſe body this ex-
" periment was made had been hanged.

“ In four ſimilar experiments, where death
“ was natural, he found the medium was
“ 109 cubic inches of air after complete
“ expiration.”

Theſe experiments, however, are by no means concluſive, for whatever may be the cauſe of death, the animal dies with an expiration, and the tendinous part of the diaphragm is thruſt up as high as the fourth, and ſometimes as high as the fifth inferior rib; and therefore the application of a compreſs round the abdomen does not ſeem adequate to prevent the diaphragm from deſcending. Could this even be effected, as the ribs cannot be kept at any fixed point, and as the air contained in the lungs was not collected, the experiment can by no means authoriſe any legitimate concluſion.

Dr. Goodwyn obſerves, that atmoſpheric air by means of its gravity, will enter into the cheſt, and by its preſſure on the external ſurface of the lungs, oblige them to collapſe. This obſervation, we preſume, is erroneous, for according to a well-known law in hydroſtatics, air and all fluids preſs equally in every direction. However great therefore the quantity of air may be in the lungs after the laſt expiration, the preſſure of the external air cannot be ſuppoſed to aſſiſt in repelling it. This appears obvious on a common bladder inflated, which the preſſure of the external air, by no means contributes to collapſe, but in the ſame manner as the lungs, where the preſſure is equal, its evacuation will depend on its own elaſticity and weight.

Thoſe who die a natural death muſt always have a portion of air remaining after the laſt expiration, ſince the lungs cannot be thoroughly evacuated by one, but in drowning, &c. repeated expirations are made with attempts to inſpire; but the latter are ineffectual. What therefore Dr. Goodwyn has advanced on this head, appears neither eſtabliſhed by argument, nor countenanced by fact. But to determine the point, the following experiment was attempted.

EXPERIMENT.

A Cat was drowned, and after the uſual ſtruggles had ceaſed, the trachea was ſecured by a ligature, the cheſt opened, and the lungs taken out. A glaſs tube divided into drachms and half drachms, by meaſure, was filled with water, and inverted in a baſon containing the ſame fluid. The trachea was then placed under the tube and divided, and the lungs being preſſed, not half a drachm of air eſcaped. The ſame lungs when diſtended contained 16 drachms of air.

This experiment was ſeveral times repeated on different animals, and ſometimes ſcarce a bubble of air was collected; in no inſtance was the proportion of air in inſpiration to that remaining on the lungs after expiration ſo ſmall as 10 to 1. The Heart has frequently been obſerved to contract, or more properly to vibrate, for more than two hours after reſpiration was ſuſpended, and that from no other ſtimulus but its own blood; while in other experiments the vibrations did not continue one tenth part of that time. The right ſide of the heart preſerves its action much longer than the left, and the auricles longer than their correſponding ventricles.

The periſtaltic motion of the inteſtines does not continue as long as the contractions of the heart, and on opening the head, the veins, as in ordinary death, are found rather diſtended, but without the leaſt appearance of extravaſation. Our next enquiries will be directed to the effects of hanging.

SECTION II.

Common Effects of Hanging.

WHEREAS, in the lungs of animals that are ſuſpended by the neck, there is always preſent a certain quantity of air; the idea has been ſuggeſted, that they poſſeſſed no power to expel it; and that, as the lungs would then be more or leſs diſtended, the diſeaſe ariſing from it, muſt differ from that produced by drowning. To aſcertain this point, the following experiment was made:

EXPERIMENT.

A dog was ſuſpended by the neck. As ſoon as the ſtruggles became violent, the fœces and urine were diſcharged. In leſs than four minutes, he ceaſed to move. The air-tube was tied, the cheſt opened, and we diſcovered the ſame appearances after hanging as after drowning; the lungs collapſed; the right ſide of the heart overloaded with blood; the left auricle not quite diſtended; the left ventricle about half. The aorta and its branches contained blood, in quantity and colour ſimilar to that from drowning.

Hence it appears, that, when an animal is ſuſpended, the muſcles of reſpiration are capable of performing their functions; nor are the muſcles of inſpiration deprived of their action: but, as the preſſure of the cord overpowers that of the external air, and cloſes the opening of the trachea, the lungs are not found expanded, but collapſed.

Our next object was, to attempt aſcertaining the exact quantity of air that remained after hanging.

EXPERIMENT.

A dog was hanged; and, when all ſtruggle and motion had ended, a ligature was made on the trachea, in the ſame manner as in the animals that were drowned: the lungs were then removed; and the orifice of the trachea being placed under the glaſs tube filled with water, the ligature was taken off. On preſſing the lungs, ſomewhat more than a drachm of air eſcaped. Theſe lungs, when inflated, contained forty-three drachms and one half of air. This experiment was often repeated; and ſometimes ſcarcely any air could be expreſſed from the lungs. At other times, the proportions in inſpiration were, to thoſe in expiration, as 11 and 12 to 1: but, in all inſtances, the quantity of air that remained was very inconſiderable.

In our next experiment, we endeavoured to aſcertain the exact proportion of the blood in the right ſide of the heart, to that in the left, after hanging.

EXPERIMENT.

A dog was ſuſpended by the neck, till he ceaſed to move. The two cavæ, pulmonary artery, and aorta, were ſecured by ligatures; and, after a careful inſpection of the heart, it was found, that the proportion of blood in the right, was, to that in the left, as 2 to 1.

The ſame experiment was repeated on a cat, and the proportion as 5 to 3. On a repetition of theſe experiments, it appeared that in ſome the proportions were as 9 to 4; in others as 5 to 3, and as 7 to 4. So that the medium ſtands as $2\frac{7}{8}$ to $1\frac{4}{8}$.

The contractions of the heart and the periſtaltic motion of the inteſtines continue nearly as long after hanging, as after drowning, the veins of the pia mater ſeem more diſtended, but without any extravaſation.

SECTION

SECTION III.

Common Effects of Noxious Airs.

IT has been generally ſuppoſed, that when animals were immerſed in any air unfit for reſpiration, it was both taken into their lungs, and again expelled. During which proceſs a deleterious effect was produced on the ſyſtem that terminated in death.

This ſuppoſition is, however, ſupported neither by argument, experiment, nor analogy; for we find the lungs equally *collapſed* in thoſe animals deſtroyed by noxious air, as in thoſe which have been drowned. In both caſes, the firſt expiration is by no means ſufficient to exhauſt the lungs.

The animals attempt to inſpire ; when they become conſcious of receiving an improper element, and the epiglottis cloſes. Air continues to be expelled, and new attempts are made to inſpire, when the trachea being again irritated by the noxious air, little or none enters the lungs, and after the laſt expiration they admit no more.

In order to diſcover the preciſe quantity of air now retained, we made the following experiment.

EXPERIMENT.

A Kitten was immerſed in nitrous air, and when it had ceaſed to breathe, the trachea was ſecured, and the lungs removed. The air was then collected as before, in the glaſs tube ; and it amounted only to $\frac{1}{2}$ a drachm*; whereas, in the diſtended ſtate, theſe lungs contained 14 drachms and $\frac{1}{4}$.

In the repetition of this experiment, different kinds of impure air were employed; and the proportion of it in the diſtended, to that of the collapſed ſtate was generally as 40 or 50 to 1; but in every inſtance the quantity of remaining air was very inconſiderable.

Our next object was to determine the exact quantity of blood in the right and left ſides of the heart.

To aſcertain this, we repeated the following experiment.

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[*] We here mean the ſame bulk occupied by half a drachm of water.

EXPERIMENT.

A Rabbit was deſtroyed by nitrous air; after which, the two cavæ, pulmonary artery and aorta, were ſecured. The blood, in the right and left heart, was then collected. The proportion of the former, was to that of the latter, not quite as 3 to 2.

From a repetition of this experiment we learned however, that the proportion was ſometimes not ſo much as 3 to 2. In one inſtance, it was more than 2 to 1.

As a medium, therefore, the quantity of blood contained in the right, may be to that in the left as 5 to 3, or as $1\frac{2}{8}$ to $\frac{6}{8}$.

We here alſo remarked, that the irritability of the heart continues but little longer than the periſtaltic motion of the inteſtines, and that in theſe experiments, they both ceaſed ſooner than in animals deſtroyed by drowning or hanging. Nor was this irritability in any one inſtance manifeſt from artificial ſtimuli after reſpiration had been ſuſpended one hour and five minutes. In ſome rabbits deſtroyed by nitrous air, the heart ceaſed to contract, from its own ſtimulus, in leſs than four minutes.

From the uniformity of theſe effects, we are authorized to conclude, that the air, in which the animals were immerſed contributed to deſtroy their irritability.

I ſhall not deny, that this effect is to be attributed to the noxious quality of the air; but ſhould rather ſuſpect, the bulk of this air, taken into the lungs of ſuffocated, does not more than equal that of the water admitted by drowned animals: for as the latter, at each inſpiration receive only a ſmall quantity of water, it is probable, the former admit only the ſame quantity of noxious air, which, mixing with what remains in the lungs, is at length nearly all expelled by repeated expirations; and a ſimilar collapſe takes place, to that which we have already obſerved, accompanies hanging and drowning.

It is a remark of Mr. Kite's, that animals deſtroyed by impure air, do not grow rigid, but remain pliant and flexible. We have however, in the courſe of our experiments, met with ſtriking examples of the contrary. Animals killed by nitrous air become ſooner rigid than thoſe deſtroyed by drowning; and in two inſtances, the rigidity of the extremities was remarkable, even before the heart had ceaſed to vibrate.

On examining the head, we diſcovered ſome ſmall diſtention of the veins.

From this brief inquiry into the viſible effects ariſing from hanging, drowning, and ſuffocation, we diſcover theſe trifling variations. That in one inſtance water enters the lungs, in the other noxious air; that this air poſſeſſes a greater tendency to deſtroy the action of the heart, than either hanging or drowning, and that after the former, more blood is found in the head, though its proportions in the different ſides of the heart, are nearly equal.

The lungs in all theſe are in a ſtate of *collapſe*. Theſe conſiderations, eſpecially the *laſt*, incline me to believe, that the cauſe which produces death in one inſtance, operates alſo in the others. But prior to an inveſtigation of the *proximate cauſe* of the diſeaſe, a curſory examination of the phyſiology of the heart and lungs may not be improper.

SECTION IV.

Phyſiology of the Lungs and Heart.

IT is by no means our deſign to extend this inveſtigation to every advantage that reſults from reſpiration, as our voice, ſmell, &c. but merely to take a rapid ſurvey of thoſe functions more immediately connected with *life*.

On this ſubject Dr. Goodwyn has beſtowed no ſmall ſhare of attention; and though the reſult of our own obſervations does not permit us to yield aſſent to many of his opinions, yet the reſources of his ingenuity, and perſpicuity of arrangement ever claim our admiration and applauſe.

But before we inquire into that particular connection which ſubſiſts between breathing and life, our firſt object is briefly to conſider the manner in which reſpiration is performed in health.

The expanſion of the thorax in ordinary inſpiration is effected by the intercoſtal and other muſcles, and its cavity lengthened by the deſcent of the diaphragm, but in laborious inſpiration, the *ſerratus major anticus*, *pectorales*, &c. bear a conſiderable part.

Expiration is ſaid to be both an active and paſſive proceſs: it is active when the abdominal muſcles compreſs the viſcera, and draw the ribs downward and inward; and paſſive from ſome of the muſcles of inſpiration at this time relaxing.

The lungs themſelves are ſomewhat elaſtic; but are paſſive in reſpiration. They may not unfitly be compared to a pair of bellows, and the muſcles of reſpiration to the power that works them: in their ſtate of expanſion, or when the muſcles of inſpiration act, a cavity is formed which admits an influx of air, but when compreſſed, or by the muſcles of expiration acting, the cavity is leſſened and the air expelled. Thus, by this alternate dilatation and contraction of the thorax, the proceſs of reſpiration is ſupported.

The action of theſe muſcles in a ſtate of health is involuntary, and is leſs influenced by the will than moſt of the other muſcles in the body: we are able, however, for a ſhort interval, to check or increaſe their action, but that it ſhould not be wholly ſubſervient to our will, is very wiſely ordained; for otherwiſe the powers of reſpiration muſt ceaſe whenever the ſenſes are ſuſpended by ſleep or inſanity.

It has been generally ſuppoſed that one of the natural functions annexed to the lungs was that of aſſiſting, by their alternate dilatation and contraction, in propelling the blood from the right to the left heart, but in health they ſeem to poſſeſs no ſuch power; for if circulation depended on their mechanical action, ſuſpending our breath for one twentieth part of a minute would produce a ceſſation of the heart's motion, and we ſhould then have but one pulſation to one expiration, whereas in health we have four.

Let theory deviſe what principle it may to explain, that in health the lungs poſſeſs no power of propelling the blood from one ſide of the heart to the other, the matter of fact is clear; (and it will appear ſo from an experiment contained in the next ſection) that the right ſide of the heart, unaſſiſted by the action of the lungs, is capable of ſending blood to the left, even after reſpiration has ceaſed. If then the heart, in a ſtate of debility, can perform this function independent of the lungs, can it be ſuppoſed unequal to it in the vigour of health? Groundleſs therefore is the ſuppoſition that attributes this office to the lungs in ordinary reſpiration.

But a ſubject more delicate and abſtruſe, a ſubject that of late years has been warmly and ably controverted, now claims our attention; I mean the alteration induced on the blood in the lungs, the cauſe on which this alteration depends; and what effect it produces on the animal œconomy.

To inveſtigate the peculiar change which the air may undergo in the lungs, is but of little conſequence to our preſent inquiry; but it is abſolutely neceſſary to trace and aſcertain the effects produced by theair on the blood, before we can obtain any knowledge of the *proximate cauſe* of the diſeaſe.

We are inclined to the opinion of the ingenious Dr. Crawford, that a principal advantage derived from reſpiration, is *animal heat*; that when the blood returns from all parts of the body to the lungs, it has loſt a quantity of its latent heat *, and imbibed ſome noxious quality; that in the lungs it meets with atmoſpheric air, containing a portion of dephlogiſticated air, which is known to poſſeſs heat in a latent form; that it abſorbs part of this heat, and at the ſame time imparts to the air which remains, its impurity.

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* According to Locke's definition, heat is a ſenſible quality; and if this definition be admitted, then, properly

That the blood having thus robbed the air contained in the lungs of a portion of its latent heat, and rendered that which remained ſenſibly warm, the air is expelled,

perly ſpeaking, there can be no ſuch thing as latent heat, as that muſt ceaſe to be heat when once it becomes inſenſible; but as the term appears to convey the idea we wiſh, that of a principle or quality exiſting in a body which cannot be meaſured, but under certain circumſtances can produce ſenſible heat, we have preferred it to others; and perhaps there is a greater impropriety in Locke's definition of heat, than in the term employed.

and freſh air taken in to undergo a ſimilar proceſs.

Dr. Crawford, in the courſe of his experiments, had occaſion to obſerve that animals immerſed in a warm, did not ſo ſoon phlogiſticate a given quantity of air as thoſe immerſed in a cold medium; nor is the reaſon inevident; for when the blood arrived at the lungs, it had not loſt ſo much of its heat, conſequently did not require to rob the air of ſo much of its purity; whereas in the other caſe, the animals being immerſed in the cold medium, were obliged to generate more heat; but to effect this, they muſt conſume a greater quantity of dephlogiſticated air than thoſe in the warm medium. It is alſo obſerved, by the ſame author, that the difference between the colour of the venous and arterial blood, was diminiſhed by expoſing animals to heat, and increaſed by expoſing them to cold.

The object of theſe experiments was to prove, that in proportion as the atmoſphere is cold, more or leſs heat is abſorbed from the air, to keep up an equilibrium of heat; and it is remarkable that the animal in the warm medium died firſt, notwithſtanding the blood was florid, and the ſurrounding air more pure than that which the animal breathed when in the cold medium.

The one dying ſooner than the other probably depended on debility; that the one in the warm medium, from being obliged to generate cold, or more properly *reſiſt heat*, was rendered weaker than the other, from this being a more expenſive proceſs to the ſyſtem than generating heat;

for

for there appears ſuch a tonic power in cold, that an animal will allow of its natural heat being diminiſhed ſeveral degrees without inconvenience, but cannot ſuffer its ſenſible heat to be increaſed more than ſix degrees at moſt of Fahrenheit, without death taking place. Hence it would ſeem that although the fluids of the one contained more of the ſtimulating quality than the other, yet from the ſolids not being ſo ſuſceptible of action, life could not continue ſo long: and it appears evident, that if the animal in the cold medium, could have exchanged its blood with that in the warm one, the difference in the duration of life would have been ſtill greater.

The objections adduced againſt Dr. Crawford's truly ingenious theory ſeem to poſſeſs but little weight. It is urged by ſome, that if breathing be the ſource of animal heat, how can it happen that the inhabitants of the northern climates breathe no quicker than thoſe of the ſouthern; and yet nearly the ſame degree of animal heat is preſent in both? The reaſon appears obvious; there is always exiſting in the atmoſphere four or five times the quantity of pure air more than we conſume by one inſpiration; ſo that thoſe in the colder climates, although they breathe no quicker, nor take in a larger volume of air, yet they rob that air of more of its latent heat.

The cold atmoſphere, bulk for bulk, muſt be ſpecifically heavier than the warm, and, weight for weight, the bulk will be leſs; ſo that any given quantity of air, in proportion as it is diminiſhed by warmth, muſt decreaſe in volume, and vice verſa. Hence in a cold atmoſphere, although the volume of air taken in at each inſpiration be the ſame, yet in that volume a greater number of particles of air are received into the lungs; and it alſo ſeems probable, that, weight for weight, this atmoſphere ſhould contain more dephlogiſticated air than the warmer, ſince it is generally allowed that in proportion as its warmth is increaſed, it becomes a better menſtruum for foreign matter of all kinds.

Dr. Crawford ſuppoſes that heat is given out in the capillaries only; but there is reaſon to believe that heat is alſo evolved during the whole of the circulation; for in amputating a limb where the tourniquet has been for ſome time applied, the firſt blood iſſuing from an artery aſſumes a venous colour; and Mr. Hunter found, from tying up the carotid artery of an animal, that the blood became black; from which it may be concluded that the blood is capable of undergoing the ſame proceſs in the larger arteries as in the capillaries. In ordinary circulation however the change muſt be leſs in degree, from the circulation being here quicker, and a greater quantity of blood being in contact with fewer ſolids.

It ſeems alſo more than probable that the blood ſtill retains a quantity of heat in a latent form after it has paſſed through the capillaries and entered the veins, for on tying up the arm in common bleeding, the longer a ligature is applied, the darker the blood becomes; and at the concluſion of the operation its colour aſſumes nearly a florid hue, which corroborates the opinion that it may poſſeſs a conſiderable portion of latent heat, after it has entered the veins; and that this blood is capable of continuing the ſame proceſs, ſo long as it contains any heat to evolve. In fever, the venous blood is ſometimes nearly florid, and Dr. Crawford found that when animals were immerſed in a warm medium, the blood paſſed through the capillaries without undergoing the uſual change; both which circumſtances tend to prove, that the blood contains more or leſs latent heat after it has entered the veins; indeed, were it otherwiſe, the lungs themſelves could not be ſupplied with heat equal to other parts of the body; as the bronchial veſſels run chiefly to the bronchiæ, and theſe veſſels are found to be inſufficient for the nouriſhment of the lungs *. But the circulation

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* It has been obſerved by Mr. Cline, whoſe accuracy as an anatomiſt it were ſuperfluous to aſſert, that thoſe inflammatory adheſions which obtain between the pleura coſtalis and the lungs, and which have acquired vaſcularity, are injectable by the pulmonary artery. On the ground of this fact, he conceives it probable, that the blood while circulating in

circulation in fiſhes puts this matter out of all doubt, for the heart of theſe animals is a ſingle one, conſiſting of one auricle and one ventricle, both of which contract from the ſtimulus of black blood; and as the blood in the coronary veſſels is of the ſame quality, its heat and nouriſhment muſt be kept up by that blood only which has paſſed through the capillaries.

Hence it is obvious, that if this black blood did not poſſeſs a quantity of latent heat, the warmth of the heart could not be ſupported, and the animal conſequently muſt die: notwithſtanding therefore that the blood, when it paſſes through the capillaries, evolves the greateſt part of its heat, yet there ſtill remains a portion of it

in the ultimate branches of the pulmonary artery, loſes the venous character, and aſſumes the arterial one; and that in this ſtate it is fit for the nouriſhment of the lungs.

in a latent ſtate even after it has entered the right ſide of the heart: and however inconſiderable this may be, yet if it is equal to the demand, the temperature of the whole animal muſt be the ſame. With a view to aſcertain the comparative temperature of arterial and venous blood the following experiment was made.

EXPERIMENT.

A Dog was hanged, the ſternum immediately removed, and the lungs inflated until the blood in the left auricle became *florid.*

The contractions of the whole heart, at this time were powerful, and Mr. Hunter's thermometer being raiſed to 98° was introduced through an opening in the pericardium, and placed on the right ſide; the mercury roſe to 99° and then became ſtationary; it was removed to the left, and the temperature was the ſame; but on making an aperture into the left auricle, and thruſting the bulb down to the ventricle, the mercury fell to 97°; and on placing it in the ſame manner within the right ventricle, it roſe above 98°.

From frequent repetitions of this experiment it uniformly reſulted that although the temperature of both ſides of the heart externally was equal; yet the heat of the blood in the right ſide exceeded that of the left, from one to two degrees.

This obſervation may appear rather ſtrange, and at firſt ſeems to contradict the opinion that reſpiration is the ſource of animal heat; but the fact can be readily explained; for the blood in its paſſage through the lungs, being contained in veſſels that are in contact with air ſo much below its own temperature, the colder body muſt rob the warmer of ſo much ſenſible heat as is neceſſary to make them both equal; and the temperature of the left auricle and ventricle is kept up above that of its contents, and equal to that of the right ſide from the heat evolved by the blood in the coronary veſſels; but if the ſenſible heat of the blood in its paſſage through the lungs be diminiſhed, its latent heat is conſiderably increaſed.

If however it be a fact, that heat is imbibed from the air during the act of reſpiration, then ſhould the blood in the left ſide of the heart retain its heat longer than that in the right, when the change has taken place, though at firſt its temperature be ſomewhat inferior.

To eſtabliſh the fact the following experiment was made.

EXPERIMENT.

A Cat was ſtrangled, the cheſt immediately opened, and the lungs inflated, when the blood in the left ſide of the heart became florid; an aperture was made in the pericardium, and the mercury of a thermometer being raiſed to 99°, the temperature both of the right and left ſides of the heart was exactly 98: on opening the left and introducing the thermometer, as in the laſt experiment it fell below 97°; but on examining the right internally, it roſe to near 99°.

So far does this experiment agree with our laſt; but the temperature of the blood was re-examined fifteen minutes after, and inſtead of the right poſſeſſing two degrees of heat more than the left, it was found, on the contrary, that the right had four degrees leſs than the left.

This experiment has been repeated by Mr. Aſtley Cooper, and in different ways, but the reſult has been invariably the ſame; that although the venous blood was ſuperior in temperature at firſt, yet before coagulation was complete, the arterial became from three to ſix degrees warmer; this, or nothing, affords a clear and deciſive proof, that heat is received by the blood from breathing; for if that blood which has paſſed through the lungs, is at firſt inferior in temperature, and ſoon after becomes ſuperior; from what can this variation ariſe but the heat received from the air in a latent form, and evolved in a ſenſible one?

We ſcarcely know of any animal, on whoſe blood the air does not induce ſome change, either directly or indirectly; and the great object of this change we deem to be the ſupport of animal heat; and from the maintenance of animal heat, that of *animal irritability* *.

There are animals which live in a temperature equal to that of their own; and it has been the opinion of ſome phyſiologiſts that in theſe inſtances their heat is ſupported by the ſurrounding medium. If this be ever the caſe, it probably is in aſcarides, and other animals of the ſame ſpecies, where the temperature of their medium ſcarcely ever varies; but I ſhould much doubt if this is the œconomy of any animal which is placed in an element ſubject to alterations of temperature. We find that nature has very wiſely ordained, that animals ſhould poſſeſs a power of retaining their temperature for a time, whether they be expoſed to exceſs of heat or cold; which in my mind is a ſatisfactory proof that their heat cannot be communicated by external temperature; indeed, if animals had not a ſource of heat within themſelves, and yet placed in an element liable to variation, life could not be ſuſtained.

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* The term irritability is very often employed in a looſe and indefinite ſenſe. We introduce it here to expreſs nothing more than a *ſuſceptibility of action*.

It requires no great ſtrength of argument to prove that animal warmth is not produced by the ſtomach. The ſimple obſervations that, in fevers, when our ſenſible heat is greater, we take in little or no food, and that ſometimes for whole weeks; and that the infant, as ſoon as reſpiration commences, and before the ſtomach receives any nouriſhment, is not leſs warm than the adult, are ſufficiently convincing that the ſtomach is not to be regarded as the ſource of animal heat.

That mere diſtention is the ordinary ſtimulus that excites the action of the heart, is the opinion embraced by ſome phyſiologiſts. Nor is it indeed improbable that a certain degree of diſtention produced by blood of a due temperature, conſtitutes the principal power which ſtimulates the heart to contract; for this power of reaction, when ſtretched beyond a certain tone, ſeems a property inherent in all muſcular fibres.

Nor do we deny that the heart, when void of blood, and ſeparated from the body, retains this action; but this is not peculiar to the heart alone; muſcles, whoſe natural actions depend on the ſtimulus of the will, poſſeſs it likewiſe, though in an inferior degree.

That the different ſides of the heart require different ſtimuli, and that there is ſomething peculiar in florid blood, which alone is capable of exciting the left ſide to action, we cannot with Dr. Goodwyn admit.

An objection preſents itſelf, that ſtrongly militates againſt this opinion; which is this, Why ſhould the ſame fibres, nouriſhed by the ſame veſſels, ſupplied with nerves from the ſame ſource, and *performing the ſame function*, be excited to action by different cauſes? This objection the Doctor is aware of, and attempts to remove it by obſerving that the animal machine offers inſtances where muſcles of ſimilar ſtructure are put into action by different ſtimuli; but this is not ſaying, that muſcles *performing the ſame functions*, act from diſſimilar cauſes; which it is neceſſary to prove before any analogy can be eſtabliſhed to favour this hypotheſis.

It is far therefore from being certain that the different ſides of the heart derive their action from different ſtimuli: and let us but examine the fœtal circulation, and it will appear that both ſides of the heart contract from the ſtimulus of blood nearly of the ſame quality; that this blood is not florid in either; for even in the umbilical vein it has undergone but a very imperfect change *, if compared with that induced on the blood which paſſes through the lungs of the adult; moreover, that the greater part of the fœtal blood arrives at the heart without paſſing through the placenta at each circulation; that is, the blood in the heart, or any other part of the adult, will receive a compleat change in the lungs, before it again returns to the ſame place; whereas, the whole of the blood in the fœtal heart will not go to the placenta, to receive the alteration at each revolution; but by far the major part will be ſent to the trunk, the head and extremities, and be returned to the two cavæ, without having entered the umbilical arteries.

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* We take it for granted that the old opinion, of there exiſting

exiſting an actual communication between the veſſels of the mother and child, is now exploded, as numerous experiments have been made to prove the contrary; and few at preſent adhere to that doctrine.

The blood in the umbilical arteries, is ſimilar to that in the trunk of the pulmonary artery of the adult circulation; that is, it is impregnated with phlogiſton, and poſſeſſes little latent heat; whereas that of the mother in the cells of the placenta is loaded with heat, and has little phlogiſton. In the minute branches of the arteries the change is performed; that is, *only* ſo much latent heat is imparted to the fœtal, and ſo much phlogiſton received by the maternal blood, as is neceſſary to reſtore the equilibrium of heat and phlogiſton; the heat therefore which is received by the fœtal blood will be ſmall, in compariſon with that imbibed by the blood of the adult in the act of reſpiration; as *only* that quantity of heat can be imparted from the maternal to the fœtal blood, as can make both their qualities with reſpect to heat and phlogiſton *equal.*

When the fœtal blood has undergone this change, it is returned by the umbilical vein; and part of it will paſs through the ductus venoſus into the inferior cavæ, and mix with the blood brought from the lower extremities; but a greater part will paſs through the vena portarum to go to the liver, where, by paſſing through capillaries, it muſt aſſume the venous quality before it arrives at the right auricle; it then unites with the blood ſent from the lower extremities and trunk of the body in the inferior cavæ, and on entering the right auricle, it mixes with the ſtream of blood coming from the head and ſuperior extremities, none of which has been to the placenta to receive the change.

The right auricle propels part of this blood (which muſt be dark) into the left, and all the blood that paſſes through the capillaries in the lungs alſo enters the left, ſo that the blood which produces the contraction of the left ſide of the fœtal heart muſt be more phlogiſticated than that of the right, as part of the blood in the left auricle has paſſed through the lungs.

If the quantity of blood conveyed to the placenta by the umbilical arteries, be compared with that ſent to the head, ſuperior and inferior extremities, and trunk, it will be found that not one fifth part of the blood goes to the placenta at each revolution, nor can this blood receive but *half the heat* the maternal blood contains; moreover, as the greater part of it muſt firſt paſs through capillaries before it arrives at the heart; and as that which does not paſs through capillaries mixes with venous blood, it is obvious that both ſides of the fœtal heart contract from the ſtimulus of black blood, and that the blood of the left ſide muſt be blacker than that of the right.

From the blood in the fœtus receiving a degree of change ſo inconſiderable, when compared to that produced in the adult by the ſame proceſs, a doubt might at firſt ariſe whether in both it was deſtined to accompliſh the ſame end, the ſupport of animal heat, and from thence that of animal irritability. That it is, will appear even from ſuperficial enquiry; and that the fœtal circulation, far from invalidating, countenances the opinion which derives animal warmth from the act of reſpiration.

The experiments of Dr. Crawford have already enabled us to obſerve that the quantity of heat abſorbed in breathing is proportional to the temperature of the ſurrounding medium. The obſervation holds equally good in the fœtal circulation; for as the fœtus is ſurrounded by the liquor amnii and uterus of the mother, the quantity of heat carried off muſt be extremely ſmall; and that which is employed being alſo trifling, there is no occaſion for more being abſorbed than is neceſſary to ſupply the conſumption of fœtal heat; and if the whole of the fœtal blood went to the placenta at each revolution, the inevitable conſequence would be death; for the power of *reſiſting* heat muſt then be called forth to action; and this in the fœtus is very inconſiderable.

On the adult, nature has wiſely beſtowed two powers for generating cold; that of evaporation from the ſurface of the body, and a power independent of this;

but the fœtus can only poſſeſs the latter, as no evaporation can take place from the ſurface of the body; and as the fœtus is deprived of this power, and as the temperature of its ſurrounding medium, the liquor amnii, is ſo much above that of our atmoſphere, if an equal degree of heat were abſorbed in the fœtal, as in the adult circulation, the animal muſt periſh; ſince the act of reſiſting heat for a few minutes is very diſtreſſing, even where the additional power from perſpiration is preſent, to counteract its deſtructive accumulation. Admirable therefore is the proviſion which nature has made, for maintaining a proper degree of heat, both in the fœtus and adult; the former is placed in a warm medium of uniform temperature, which permits but little heat to be conſumed, and the circulation is ſo regulated as only to allow the abſorption of a ſmall and *limited* quantity of heat; ſo that great powers for reſiſting heat are here unneceſſary.

But in the adult, the varying and changeable temperature of the air makes it neceſſary that more or leſs heat be abſorbed, to correſpond with the variation to which it is expoſed. We are therefore immerſed in an atmoſphere ſupplied with ſufficient heat to anſwer our demand; and by evaporation, &c. we are enabled to reſiſt heat, ſo as to prevent its undue and deſtructive accumulation; on the other hand, from the warmer medium which encompaſſes the fœtus, we may gather the reaſon why a ſmaller portion of heat ſhould be imbibed, and from this being *limited*, why it ſtands in no need of evaporation for the generation of cold.

Were the change induced on the blood during circulation intended *ſolely as a ſtimulus to ſupport the action of the left ſide of the heart*, then ſhould the alteration produced in the fœtus be equal in degree to that produced in the adult; but that this is not the fact we have already, and we hope not unſucceſsfully, endeavoured to prove; and indeed if this was the intention of nature, it is highly improbable ſhe would have ſo contrived it that the connection between the mother and child ſhould take place at the umbilicus, where a great part of the blood which has been at the placenta, muſt firſt have paſſed through capillaries before it enters the left auricle, and where its purity in the right ſide of the heart would be ſuperior to that in the left. We might ſooner ſuppoſe that the umbilical vein would have terminated in or near the left auricle, to ſupply it with blood thus duly altered, than that the blood contained in the *left ſide of the heart*, ſhould be *ſimilar in quality* to that in the umbilical arteries which goes to *receive* the alteration ; for, in this circumſtance, the vein contains blood that has undergone the change, but the arteries carry blood that is going to receive it.

If therefore the left ſide of the fœtal heart and the whole of the arterial ſyſtem poſſeſs no ſtimulus but that of black blood ; if the pulmonary artery in the adult be excited only by this blood ; if, in a word, the heart of fiſhes act on no other blood, is it not obvious (at leaſt as far as induction and analogies can prove) that in the adult alſo venous blood can excite the action of the *left ſide of the heart and arterial ſyſtem*, and conſequently that the two ſides of the heart do not require to be ſtimulated by diſſimilar cauſes ?

From conſidering that one ſide of the heart in the adult circulation contains black blood, and the other florid; and that in ſuſpended reſpiration the left ſide firſt ceaſes to act, when both contain black blood, Dr. Goodwyn, we preſume was induced to conclude that venous blood which ſupports the action of the right ſide, was an unfit ſtimulus to keep up the action of the left.

The obſervations however we have ventured in ſupport of the idea, that the whole of the heart owes its action to one and the ſame cauſe, oblige us to withhold our aſſent from that of Dr. Goodwyn; but before we attempt an explanation of the cauſe which protracts the action of the right ſide of the heart beyond that of the left, we deem it neceſſary to inſtitute a previous inveſtigation of the effects produced on the heart by blood that has been duly changed, and next enquire into the conſequences that muſt enſue when no alteration has been given.

We have already obſerved that when the blood arrives at the right ſide of the heart, it is impregnated with phlogiſton; and deprived of the greater part of its latent heat; in health it is to part with its phlogiſton or inflammable principle in the lungs, and there alſo receive a freſh ſupply of heat; it is then propelled into the left ſide of the heart, and thence through the whole of the circulating ſyſtem, to evolve and diſtribute heat, and receive phlogiſton.

In conſequence of this proceſs, the left ſide of the heart and coronary veſſels are ſupplied with blood, which diſtributes heat and nouriſhment to the whole of the heart; and in ordinary circulation it is probable that the heart derives its heat principally from the blood in the coronary veſſels; but if the motion of the circulating fluid be checked, or totally ſuſpended, then would the blood in the cavities of the heart, continue to undergo the ſame proceſs; at leaſt ſo long as it poſſeſſed any heat in a latent form; for it has already been proved, that if blood be delayed in the larger arteries, it is known to aſſume the ſame change and appearances as when it has paſſed through capillaries. The blood within the coronary veſſels not only ſupplies the left ſide of the heart with heat, but alſo the right; and if the heart derived heat ſolely from the blood within its cavities, their temperature in health would be equal; for although the blood in the left ſide of the heart, might contain 60 degrees of latent heat, when the right poſſeſſed but ſix; yet if the *ſenſible heat evolved* be only equal to two, their temperatures muſt be the ſame.

The reſult of multiplied experiments authorizes the aſſertion, that immediately after the action of the left ſide of the heart is increaſed by florid blood, the right alſo becomes equally affected; nor is this effect an unnatural or unexpected conſequence; for as the coronary veſſels ſoon receive this blood, and as theſe veſſels are going to both ſides of the heart, the heat and irritability of both muſt be equally ſupported.

The great and natural ſtimulating power that keeps up the *action* of the heart, we have already ſuppoſed to be diſtention; but this muſt ceaſe to act as a ſtimulus whenever the blood becomes incapable of ſupporting the irritability of the heart, by imparting to it its wonted and neceſſary degree of heat. To effect this the blood muſt part with its inflammable principle in the lungs, and in return imbibe from the air a freſh ſupply of latent heat.

Dr. Cullen imagined, that the heart's continuing to act after breathing had ceaſed aroſe from habit; but were that the caſe, why ſhould the action of the right ſide of the heart outlive that of the left; and why ſhould not this influence of habit extend equally to arteries? Inflating the lungs ſoon after reſpiration has ceaſed, generally increaſes the action of the heart, even from the firſt expanſion; and it ſeems to ariſe from the mechanical ſtimulus, which the lungs apply to the heart by diſtention; as in proportion to the expanſion their ſurface will preſs upon the two ſides of the heart, and thus become an irritator.

If inflation however be deferred for a conſiderable time, the ſame effect will not follow; as this degree of irritability is ſeldom permanent; and diſtention of the lungs ſoon ceaſes to be an adequate ſtimulus; but by making repeated inſpirations to one compleat expiration, the irritability of the heart is ſoon revived, and an action produced by each inflation. This depends on the proceſs of circulation being duly carried on, and the neceſſary ſtimulus imparted from the air to the blood, which increaſed the living powers of the heart, and rendered it ſuſceptible of irritation from ſo ſlight an external cauſe, as the mechanical action of the lungs.

To this opinion, of the action of the heart proceeding from mechanical ſtimuli, Dr. Goodwyn oppoſes this inference: If it were ſo, ſays the Doctor, any aerial fluid would be then equally effectual. But this is rather unfair reaſoning; for it is agreed on all ſides, that a change in the blood is neceſſary to the life, and uninterrupted action of the heart: and although the introduction of noxious air may prove as great a ſtimulus to the ſurface of the heart as any other, yet if the blood ceaſes to receive the change when the heart acts, the irritability of this organ muſt gradually diminiſh, as the blood continues to evolve its heat, without receiving the uſual ſupply; and what before was ſufficient to irritate the ſurface of the heart, no longer poſſeſſes that power. It is true, the heart will act on introducing any air into the lungs for one or two inſpirations, if the experiment be made immediately after breathing is ſuſpended; and this is a circumſtance that corroborates the opinion of this action ariſing from mechanical ſtimuli. That it is not to be aſcribed to any change immediately induced on the blood *already in the left auricle* is obvious; for the right ſide of the heart muſt be excited to action before the left can receive blood that has undergone the change; as no alteration can be given to the blood contained in the auricle.

Dr. Goodwyn is of a contrary opinion; for he obſerves, " that the contractions of " the left auricle and ventricle are imme- " diately effected by the quality of the " blood paſſing into them."

We ſhall endeavour in the next ſection, to demonſtrate by experiment, that no alteration can be produced on the blood in the trunks of the pulmonary veins and left auricle, if the communication be cut off from the right ſide of the heart: and it muſt be manifeſt, that if the blood *already* in the left auricle could receive an immediate change, from the air in the lungs, the right, which is equally in contact with them, ſhould alſo receive it.

This opinion we are therefore diſpoſed to regard rather as one of the many offſprings of the author's fruitful ingenuity, advanced to ſupport a favourite hypotheſis, than to evince the genuine dictates of his judgment and conviction.

That the right ſide of the heart continues to act, after the left has ceaſed, is a phenomenon that has been noticed by almoſt every phyſiologiſt; but few, if any, have attempted to unfold its cauſe. Indeed Dr.

Goodwyn appears to be the only one who has ſeriouſly endeavoured to explain its rationale, and attempt its illuſtration; and though there is no authority to which we would more gladly refer, yet we cannot here adopt his opinion, *that the left auricle and ventricle, firſt ceaſe to act, from the ineptitude of venous blood to excite their contraction;* and *that this is the immediate cauſe that ſuſpends circulation in drowning, &c.*

But in order to explore the true cauſe of this phenomenon, let us once more recollect that the blood, when it arrives at the right ſide of the heart, has loſt the greater part of its latent heat; that in health it receives this ſupply in the lungs; but that *in ſuſpended reſpiration*, the blood paſſes through the minute ramifications of the pulmonary artery into the pulmonary veins, without receiving this neceſſary quality, and inſtead of diſcharging phlogiſton, and abſorbing heat, that it will continue to *evolve its heat*, and receive a new increaſe of phlogiſton.

An eſſential difference thus takes place between the blood of the two ſides of the heart; the right contains a fluid that ſtill poſſeſſes latent heat; but the left has little or none; and as the blood in the one is furniſhed with more heat to evolve than the other, its irritability of courſe muſt be greater; and the ſtimulus of diſtention is alſo predominant at the right ſide, which will conſequently ſupport the action of the one, when no effect is produced on the other.

That in ordinary circulation, both ſides of the heart might derive their heat principally from the blood in the coronary veſſels, has already been remarked; but as this blood in ſuſpended breathing contains little or no latent heat, from having evolved it in the lungs, the heart muſt in that caſe imbibe its heat from the blood contained within the cavities; and that this proceſs can be carried on in them we have already ſhewn, ſo long at leaſt as their blood poſſeſſes latent heat to give out, and while the circulation is retarded or totally ſtopt. From which we conclude, that *if the right ſide of the heart in this diſeaſe poſſeſſed the blood of the left, and the left the blood of the right, the difference of irritability would be reverſed.*

If however, we have ſucceeded in eſtabliſhing as facts, that when the blood arrives at the right ſide of the heart it ſtill contains a portion of heat in a latent ſtate; that this blood in ſuſpended breathing continues to evolve heat in a ſenſible form ; that the inferior degree of irritability in the left ſide depends on the eſſential difference in the quality of its blood from that of the right ; that moreover this difference in quality proceeds from that of the left having been robbed of a quantity of its heat in its paſſage through the capillaries of the lungs; if, I ſay, theſe facts can be eſtabliſhed, then the temperature both of the right ſide of the heart, and its contents, ſhould be greater than that of the left in this diſeaſe.

The reſult of the two laſt experiments we have mentioned, allowed us to conclude, that both ſides of the heart externally are of the ſame temperature when the blood has received its due change from the air, though the temperature of this blood thus altered is inferior to that of venous ; and though the blood of the left ſide be at firſt lower in degree of warmth, yet its heat ſoon after becomes predominant.

The next experiment was made, to aſcertain the temperature of the two ſides of the heart, and their contents; where no change had been given to the blood.

EXPERIMENT.

A Rabbit was ſtrangled, and the cheſt being opened, a ſmall aperture was made in the pericardium, and a thermometer of Fahrenheit's ſcale was applied to the right ſide of the heart. The mercury roſe to 96°, where it remained ſtationary: it was then removed to the left, where it fell to 94°. On placing it within the right auricle, the mercury again roſe to 96°, and when applied in the ſame manner within the left, it fell ſomewhat below 94°.

This experiment was repeatedly made on animals that had been drowned and hanged, both without and within the heart, and there occurred a few inſtances where there was ſcarcely any difference in the temperature of the two ſides at *firſt*; but in all, the temperature both of the heart and its contents was predominant in the right, before the left ſide had entirely ceaſed to act. It appears therefore very evident, that the blood which paſſes through the lungs into the left ſide of the heart, without receiving from the air the neceſſary change, inſtead of being more tenacious of its heat than the right, on the contrary, loſes it much ſooner.

Thus we ſee the reſult of experiment ſanction and juſtify the predictions of theory, that when blood paſſes from the right ſide of the heart to the left, without having been in contact with dephlogiſticated air, to renovate its heat, it muſt evolve in its paſſage through the capillaries of the lungs what little it contained in a latent ſtate; and the left ſide being no longer ſupplied with its due nouriſhment and warmth, either from the blood in the coronary veſſels, or from that contained in its own cavities, muſt have its temperature reduced, its irritability decreaſed, and its action gradually ſuſpended, by the diminution of its ſtimulus of diſtention.

But far different is the condition of the right ſide; for although the blood in the coronary veſſels is incapable of ſupplying it with heat, yet the blood within its own cavities contains a quantity in a latent form, which it continues to evolve; thus is its irritability ſupported, and thus, by continued diſtention, is its action kept alive.

Dr. Goodwyn having obſerved that in this diſeaſe all the cavities of the heart contain black blood, was induced to conclude that its other qualities were exactly ſimilar; but had it been conſidered that in theſe circumſtances the blood, in its paſſage through the lungs, ſuffers a deprivation of its remaining heat, without the acceſſion of a new ſupply, the cauſe whence originates the difference of irritability in the two ſides of the heart would have no longer remained obſcure, nor would the Doctor, to explain the phœnomenon, have been reduced to the ſuppoſition that the ſame muſcular fibres were excited to action by different cauſes, and that the blood of the ſame quality that ſtimulated the right ſide to contract, was incapable of producing the ſame effect on the left, but this difference would have been diſcovered to ariſe from the left having loſt a greater portion of its heat, and its ſtimulus of diſtention being diminiſhed beyond that of the right.

The advantages derived from this property of the right ſide of the heart, which ſupports its action after that of the left is ſuſpended, ſeem to have eſcaped the notice and eluded the reſearch of phyſiologiſts, yet no proviſion of nature more deſervedly claims our admiration and enquiry; for in no department of the animal œconomy has ſhe managed a wiſer precaution for the preſervation of life, than by thus, after the laſt expiration of the animal, prolonging to the right ſide of the heart a ſtimulus and power of action ſuperior to that of the left.

Let us but ſuppoſe the reverſe, that the left had the irritability of the right, and the right the irritability of the left; as it is found neceſſary to the effecting a recovery, that the right ſhould firſt contract, and ſupply the left with blood, in order to excite it to action; and as the right, in this ſuppoſition, would ſoon be incapable of performing this function, we ſhould only be enabled to recover thoſe in whom the actions of life had been ſuſpended only a very ſhort time after reſpiration had ceaſed; whereas, from the right continuing to contract after the left is motionleſs, it is thus capable of propelling blood through the lungs into the left auricle, which being once reſtored by the arrival of duly prepared blood (even though it ſhould have ceaſed to act from the ſtimulus of its own) is enabled, by the freſh ſupply of this ſtimulating quality, to revive, and the action of the whole heart is encreaſed; but if the irritability of the left ſide were at firſt predominant, it would get rid of its own blood, and the feeble action of the *right ſide* be incapable of ſupplying it with more.

Thus, at the very origin of the circulation, where the freſh ſtimulus is laſt applied, Nature, ever wiſe in her operations, has prudently placed a ſuperior degree of irritability, while in the left, where the irritability is inferior, the increaſe of ſtimulus is firſt received: nor will this be deemed the reſult of chance, if we but recall an obſervation we have already mentioned, that in the fœtal circulation, the ſtimulating quality of the blood is greater in the right ſide of the heart than that in the left, and that in the adult it is reverſed.

But although the blood, in theſe two ſtates of the animal, poſſeſs this difference of ſtimulus in the different ſides of the heart, yet, if an injury threaten the life either of the fœtus or the adult, the right ſide of the heart will be found to contain blood of a ſtimulating quality ſuperior to that of the left, and conſequently greater irritability; for let us ſuppoſe that, at the time of birth, the umbilical chord is prevented from carrying on the circulation to and from the placenta, the blood that runs to the left heart, from its being obliged previouſly to paſs through the capillaries of the lungs, is deprived of a portion of its ſtimulus: and thus, in the morbid ſtate, is the ſame proviſion made for the fœtus as for the adult, though their natural circulation be widely different.

There is reaſon to ſuſpect that in man there does not exiſt ſo much irritability as in animals of more ſimple conſtruction; for it ſeems that in the more perfect or complicated, as man, whoſe ſentient powers are greateſt, the vital are leaſt; and we believe this will hold good in gradation with all the inferior animals, that, in proportion as the ſentient powers abound, the vital diminiſh, and *vice verſa.*

This is ſtrikingly exemplified in the polypus, which has been obſerved to regenerate into as many different polypi as divided into pieces; and theſe animals have neither brain nor ſpinal marrow.

It appears therefore not improbable to be the intention of the great Creator, that thoſe animals, whoſe powers for perceiving danger are leſs acute, ſhould be capable of receiving greater injuries without the deſtruction of life, than thoſe that are armed with this faculty in a ſuperior degree.

All impreſſions made upon ſuperior animals are immediately conveyed to the brain, and this being the great ſenſorium, the whole animal receives the alarm, and an immediate effort is made to remove the cauſe of the injury. But inferior animals, that are unprovided with nerves and brain, that are conſequently deſtitute of ſenſation, and whoſe powers of inſtinct are but feeble, Nature, we find, to compenſate for this want of ſenſation, has enabled them to withſtand injuries to a greater degree than thoſe that are furniſhed both with brain and nerves. Animals alſo that are endowed with ſuperior ſagacity, poſſeſs but a ſmall degree of irritability; and it ſeems to be juſtly remarked, that the irritability of animals decreaſes as they advance in age. This was certainly intended for the ſame excellent purpoſe, that of ſupplying the defect of ſagacity while young; but when the ſentient powers became adequate to the neceſſity, this exquiſite irritability, which was ſo wiſely beſtowed on them while young, is no longer required.

In different ſpecies of animals, we have ſometimes obſerved that after reſpiration is ſuſpended, from drowning, &c. &c. ſcarce any action remained in the right ſide of the heart; but in ſeveral experiments, particularly in one, the cauſe of this phœnomenon we diſcovered to ariſe from an over diſtention of the right auricle and ventricle; for when a ſmall puncture was made in the ſuperior cava, and a portion of the blood contained in the right heart expelled, its contraction became extremely powerful.

Here then was indirect debility brought on from over diſtention; and there is reaſon to ſuſpect that this may frequently happen from the method of recovery uſually adopted.

There remains a ſuſceptibility of action in almoſt every part of the body, for ſome time after the ſuſpenſion of the ſentient powers; but as animals, whatever may be the cauſe of their deſtruction, begin to die firſt at the extreme and exterior parts; ſo, in ſuſpended reſpiration, from drowning, &c. we find the irritability of the heart outlives that of any other part of the body. One exception indeed has occurred, where the heart and extremities ceaſed to act nearly at the ſame time.

From conſidering the length of time the heart may be made to contract after breathing has ceaſed, there can ſcarce be any doubt, if electricity be unable to excite it to action, but that life is irrecoverably loſt;

for, with Mr. Hunter, we imagine life and the power of action to be intimately connected. If therefore we are incapable of calling forth this power into action, by the ſtimulus of electricity applied to the heart, there does not remain the moſt diſtant probability that the effect can be produced by the application of any other ſtimulus.

In our attempts, however, to reſtore the life of the apparently dead, we are furniſhed with no criterion for determining when this power of action is thoroughly extinct; for the exterior parts may have loſt this degree of irritability, and the heart ſtill retain it. In ſome inſtances, the heart of young animals has been made to act by electricity from ten to fourteen hours; and a gentleman, on whoſe veracity I can rely, has informed me he has ſeen it contract even twenty hours after reſpiration was ſtopped, and which is many hours longer than we have been able to excite action in any external part.

It has been obſerved by Mr. Kite, "that "the electrical ſhock is to be admitted as "the teſt or diſcriminating characteriſtic of "any remains of animal life, and ſo long as "that produces action, may the perſon be "ſaid to be in a recoverable ſtate; but when "that effect has ceaſed, there can no doubt "remain of the party being abſolutely and "poſitively dead."

With the deference due to Mr. Kite's authority, we cannot but withhold our aſſent from this opinion, ſince it appears to be fraught with ſuch imminent danger; for if we conclude that life is departed when no external action can be excited by electricity, we ſhall frequently neglect the application of remedies, when the power of action an life are ſtill preſent in the heart.

There have been caſes, and I myſelf have ſeen one, where no recovery was effected, even when contractions were produced externally; but the want of ſucceſs in this inſtance is not to be attributed to the weaker powers of the heart, but to the inſufficiency of the plan of treatment; for it is probable that a recovery is not only to be effected in moſt inſtances where external contractions are viſible, but in many where this degree of irritability is deſtroyed, if *proper remedies* are had recourſe to. It appears ſomewhat extraordinary that Mr. Kite ſhould have recommended ſo dangerous a prognoſtic (built merely on hypotheſis) as that life was abſent when external irritability was not manifeſted by electricity; for it is obſerved in the ſame ſection, " that

" irritability and vital heat appear to be co-
" equal:" which opinion is incompatible with the other; for if heat and irritability co-operate, then, as external heat diminiſhes quicker than internal, it muſt follow, according to the author's own reaſoning, that external irritability muſt ſooner ceaſe than internal; and, as internal excitement may not produce external action, the concluſion that life is extinct, when irritability is no longer viſible from electricity, muſt be fallacious.

We were at firſt inclined to the opinion that irritability and animal heat might co-exiſt; that, from the latter being preſent or abſent to a certain but unknown degree, we might be able to draw a prognoſtic of the preſence or extinction of the other; but ſubſequent obſervations diſcovered this theory of Mr. Kite's to be likewiſe erroneous; for, as there are few whoſe ſolids are not very differently excited to action by the ſame cauſe, ſo the quantity of heat evolved from the blood, that would ſupport irritability in the one, would produce no effect on the other.

This opinion is confirmed by the following experiments:

EXPERIMENT.

A ſmall Puppy was drowned, and on examining the temperature of the two ſides of the heart in the pericardium, the right was 98°, the left 96°. The right ſide of the heart continued to act for more than two hours; and during the laſt ten minutes, its temperature was 60°, that of the left 57°; the warmth of the air in the room 55°.

EXPERIMENT.

A full-grown Dog was hanged, the pericardium opened, and the temperature of the right ſide of the heart was 100°, the left 99°. The right continued to act not quite ten minutes, when its warmth was 90°, that of the left 87° and one-half: the temperature of the room was alſo 55°.

Here then action continued in the one more than twelve times longer than in the other, though with a degree of heat much inferior. We here alſo had a farther opportunity of being convinced that heat and irritability do not always co-exiſt, from the bodies of two perſons that had been executed. A powerful electrical ſhock was given, without producing the ſmalleſt external action, although three hours after execution the temperature of one was 80° externally, and the other 82° at the expiration of two hours and one-half.

This ſuperior degree of heat, above that of the atmoſphere, does not proceed, as Mr. Kite imagines, from the preſence of ſome "internal animating principle;" for the longer or ſhorter continuance of ſenſible heat of any animal muſt always be proportionate to the quantity of latent heat the blood contains, and the temperature of the ſurrounding medium; whereas the difference of irritability much more depends on the readineſs with which the ſolids act when this ſtimulus is applied, than on the quantity of heat that is evolved.

Why the fibres of one animal of the ſame ſpecies ſhould more readily act than thoſe of another, from the ſame cauſe, and how we are to diſcover the different degrees of this ſuſceptibility of action in each particular animal, is a queſtion not leſs important, than intricate to unravel. As we have endeavoured to prove that *heat and irritability* do not neceſſarily co-exiſt, this may at firſt ſeem to militate againſt the opinion of heat being eſſential to the ſupport of irritability; but in reality it does not, for altho' the fibres of one animal ſhall act with its temperature at 60°, the fibres of another ſhall ceaſe with its temperature at 90°: yet this only proves that the ſolids of the one act from a ſlighter cauſe than thoſe of the other, and not that the ſtimulus of heat is wanting. A certain quantity of inebriating liquor ſhall produce violent effects on one perſon, when a much greater quantity ſhall have no effect upon another.

The ſame reaſoning holds good in theſe experiments; for although the heat of one animal may exceed that of another, and where the inferior degree of heat is preſent, the greater effect be produced; yet the *ſtimulus* in *quality* is the *ſame*, and the difference of action depends on the moving powers of the one being more readily excited to act than thoſe of the other. Nevertheleſs, though no deciſive prognoſtic can be drawn of the preſence of *irritability*, from the preſence of *any known degree of heat*, yet the nearer the degree of heat of any particular animal approaches to its ſtandard, the greater muſt be its irritability; but it will ever be better to fix no criterion of life, and make uſe of every poſſible means of recovery, in every inſtance, than to form a hazardous prognoſtic, that may prove fatal to hundreds.

Having now examined the common effects that ariſe from the ſuſpenſion of reſpiration in Drowning, Hanging, and Suffocation, and particularized the advantages derived from the Heart and Lungs, we ſhall, in the next Section, endeavour to aſcertain the *immediate cauſe* of the diſeaſe.

SECTION V.

An attempt to aſcertain the proximate cauſe of the diſeaſe produced by Submerſion, Strangulation, and Suffocation.

TO inveſtigate and eſtabliſh the proximate cauſe of the diſeaſe ariſing in ſuſpended reſpiration from drowning, hanging, &c. is a taſk that has engroſſed the attention, and exerciſed the pens of ſeveral eminent phyſiologiſts; but there has been little coincidence of opinion, each ſeeming to have ſtarted, and embraced an hypotheſis of his own.

It has been the idea of ſome, that the air contained in the lungs becomes highly phlogiſticated, and that from its deleterious influence, originates the diſeaſe. Others attribute it to a congeſtion of blood formed in the heart and lungs, while another claſs ſuppoſe death to be produced by apoplexy.

To none of theſe opinions does Dr. Goodwyn incline; to him it appears that from the privation of the uſual ſtimulus ſupplied by the air, the blood *contained in the left auricle and ventricle* is rendered incapable of exciting their contraction; and hence he derives the *immediate cauſe of the ſuſpended circulation.*

From an authority we ſo highly reſpect, it is with diffidence we diſſent; but argument, obſervation, and experiment all tend to prove this opinion erroneous.

If the preſence of black blood in the left heart was the *proximate cauſe* of circulation ceaſing, then we ſhould certainly find it *fully diſtended* from the action of the right, but we have endeavoured to prove that this is by no means the fact; and indeed, if the left auricle and ventricle were *fully diſtended*, and it were neceſſary for the reſtoration of life that the blood *already contained* in the left auricle ſhould undergo a change, before it was enabled to empty itſelf, then every animal would be irrecoverable as ſoon as this black blood had once diſtended the auricle; for we can appeal to the teſt of experiment to prove, that no alteration can be produced on the quality of the blood contained in the trunks of the pulmonary veins and left auricle.

To aſcertain if any ſuch change could be effected, the following experiment was made.

EXPERIMENT.

A Dog was ſuſpended by the neck until he ceaſed to move; on opening the cheſt, both ſides of the heart were obſerved to contract; but the left ceaſed in eight minutes, while the right continued to act ſtrongly. The pulmonary artery being carefully ſeparated from the aorta, and ſecured by ligature, we proceeded to inflation, which was continued fifteen minutes, without enabling us to empty the trunks of the pulmonary veins and left auricle, or produce any apparent alteration on the quality of the blood.

This experiment was repeated on a cat, during the action of the left ſide of the heart, which became leſs diſtended, but no alteration in the colour of its blood could be produced. The change therefore which the blood undergoes in its paſſage through the lungs, is effected before it enters the *trunks of the pulmonary veins and left auricle*, and as the air cannot come in contact with *this blood* to produce any chymical alteration, it muſt be propelled through the ſyſtem unaltered, whenever an animal recovers; for ſuppoſing the blood within the lungs to have undergone its uſual change from inflation, as the trunks of the pulmonary veins and left auricle are here underſtood to be *full*; and as *this blood* can receive no chemical change, the left auricle muſt act on its *black blood*, and receive the contents from the trunks of the pulmonary veins (which we have ſaid has not undergone the change) before the left heart can contain blood duly prepared by the air. We were, at firſt induced

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to believe that the collapſe of the lungs after inflation, might have the power to empty the left auricle mechanically, by propelling the contents of the pulmonary veins onward, and by the preſſure thus applied from without, to the blood within the auricle, to ſtimulate its muſcular fibres to react, and ſo expel a portion of its contents. But there ſeems an objection to this mode of reaſoning; for if the lungs by their collapſe had any ſuch power, they muſt have exerted it at the laſt expiration, and then thoſe veſſels which are affected by this action would be ſo far emptied as to require a freſh ſupply of blood from the right ſide of the heart, before the lungs could by their collapſe, have any mechanical effect on their contents; and the next experiment proves, that after reſpiration is ſuſpended, very little blood is left within the lungs.

EXPERIMENT.

A Cat was drowned, and when all motion had ceaſed, we opened the cheſt and ſecured the pulmonary artery. A ſmall ligature was then paſſed round the trunks of the pulmonary veins, as they enter the left auricle, and both auricle and ventricle were then opened; the blood being all taken up by a ſponge, the trunks of the pulmonary veins were divided, and on preſſing the lungs very little blood eſcaped, except that contained in the trunks. The repetition of this experiment afforded the ſame reſult. We muſt therefore look elſewhere for reaſons to account for the action of the left auricle in recovery, as experiment proves that by inflation we can produce no chymical change within the trunks and auricle, nor by the mechanical action of the lungs empty the trunks, if the communication be cut off from the right ſide of the heart; as this, I ſay, cannot be effected, it would ſeem that when the right ſide of the heart acts during inflation, there is a quantity of blood ſent within the lungs; and this contraction, aſſiſted by an artificial collapſe * of the lungs, propels a portion of the contents of the pulmonary veins onward, and thus produces ſuch a vis-a-tergo on the blood within the auricle, as to excite it to contract. It has been before obſerved that the right ſide of the heart *in health* performs this function independent of any mechanical action of the lungs, and it is likewiſe capable of doing it for ſome minutes after reſpiration is ſuſpended; but where the contraction of this organ is inſufficient to propel blood through the lungs, producing an *artificial collapſe* will have the ſame effect. This however can only happen where a freſh ſupply of blood has been produced by the contraction of the right ſide of the heart; for experiment demonſtrated that the quantity of blood remaining in the lungs was too ſmall to enable their mechanical action to have any effect on their contents.

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* By artificial collapſe we mean emptying the lungs of the greater part of their air, which will compreſs and evacuate the pulmonary veſſels; but collapſe from an ordinary expiration has no ſuch effect.

It has been mentioned by Haller and other able Phyſiologiſts, that where the lungs are collapſed, an obſtruction to the paſſage of the blood through them will be the conſequence; but they have not proved *that the lungs are in ſuch a ſtate of collapſe in Drowning, Hanging and Suffocation.*

We have endeavoured to ſhew that Dr. Goodwyn's experiments to determine this point were objectionable, and our enquiries preſented reſults very oppoſite to his, that inſtead of the lungs being diſtended that they were collapſed, and contained but very little air. In order, however, to prove that *this degree of collapſe* was ſufficient to produce a mechanical obſtruction in the lungs in Hanging, Drowning, &c. we compared the quantities of blood in the different ſides of the heart, where the collapſe was removed to that where the collapſe exiſted.

The experiments were conducted in the following manner.

EXPERIMENT.

A Dog was ſuſpended by the neck, and in leſs than a minute the fæces and urine were diſcharged; his ſtruggles continued for little more than three minutes, when he ceaſed to move; the trachea was then laid bare, and divided, and the lungs fully diſtended with warm water (about blood heat) through the medium of a funnel; the trachea being ſecured ſo as to permit no water to eſcape, the cheſt was opened, and, contrary to all experiments made before, there was found a much leſs quantity of blood in the right ſinus venoſus, auricle, ventricle, and pulmonary artery, than in the left, which was loaded with blood, part coagulated, and the whole quite black. The experiment was repeated, and yielded nearly the ſame reſult, with this variation, that the right ſide of the heart had a little more blood than before, but the left was again fully diſtended.

It then appeared evident, that if by an artificial diſtention of the lungs only, without the admiſſion of air to produce any chymical change on the blood, the right ſide of the heart was capable of diſtending the left, and of expelling a part of its own contents, that in ſuſpended reſpiration there exiſts ſuch *a mechanical obſtruction in the* * *interior pulmonary veſſels from collapſe of the lungs*, as prevents the right ſide of the heart from getting rid of its contents.

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* By interior pulmonary veſſels is meant thoſe that ramify within the lungs, and are influenced by the air; and by the trunks we mean thoſe veſſels that ariſe from the auricle, and are attached to the ſurface of the lungs.

The experiment was therefore repeated with ſome alteration.

EXPERIMENT.

A Cat was drowned, and after the ceſſation of all ſtruggles, an aperture was made in the trachea, and the lungs diſtended with air which was retained. On opening the heart we found the contents of the left ſide were to that of the right as five to four.

EXPERIMENT.

A Dog was drowned; when he ceaſed to move, cold water was introduced into the lungs. On examining the heart we found the proportions of the blood in the left were to that in the right as ſix to five.

Theſe experiments were repeated, and ſometimes the proportions were as ſix are to four; but in one, where the irritability was trifling, the blood was a little predominant in the right. On the contrary, in another, where great irritability was preſent, the proportions were as two to one.

It may be urged by ſome as an objection to the above experiments, that water may act as a ſtimulus to the pulmonary veſſels, ſo as to excite them to act; but it has been obſerved, that there remains very little blood within the lungs after the laſt expiration; and if water acted on them as a ſtimulus, it could not however produce any effect on the trunk of the pulmonary artery, right auricle and ventricle, which we find in part emptied.

We have obſerved that animals under the common method of ſuſpenſion, retain the power of expelling air from the lungs; but it was found not impoſſible ſo compleatly to compreſs the trachea, as to prevent any air from eſcaping: with this view the following experiment was tried.

EXPERIMENT.

The trachea of a Kitten was laid bare, and a ligature paſſed round it, that the whole of the air might be confined within the lungs. The animal ceaſed to move in four minutes and a half; and on opening the heart we found the proportions of blood in the left ſide, were to that of the right as nine to ſeven.

The ſame experiment was repeated on a Rabbit, and the proportions were as eight to ſeven.

In theſe experiments therefore, where the muſcles of expiration had not ſufficient power to overcome the compreſſure of the cord, and expel air from the lungs, the blood accumulates to a greater quantity in the left ſide of the heart, becauſe no collapſe takes place, and conſequently no obſtruction to the paſſage of the blood through the lungs.

The next experiment was made on an animal that had been ſuffocated, by diſtending its lungs with nitrous air.

In order to perform this experiment a common bladder was procured, and a pipe affixed to its neck, ſmall enough to be inſerted into the trachia of a rabbit. This pipe was introduced through a cork adapted to the ſize of a wide mouthed bottle, which contained copper with diluted ſpirits of nitre. The nitrous air ariſing from this ſolution, was collected in the bladder, and when a ſufficient quantity was obtained, we attempted the following experiment.

EXPERIMENT.

A ſmall Rabbit was deſtroyed in nitrous air, and as ſoon as it diſcontinued to expire air from its lungs, we removed it from the medium in which it was plunged. A ſmall aperture was then made in the trachea, the bladder taken from the bottle containing the nitrous air, and the pipe introduced into the trachea in order to diſtend the lungs; which being effected, the air was prevented from eſcaping, by tying the trachea. On examining the heart, the proportion of blood in the left was to that in the right as ſeven to ſix.

The experiment was again repeated by deſtroying an animal in fixed air, and diſtending the lungs with nitrous air; and the proportions in the left were to thoſe in the right as thirteen to twelve.

But theſe laſt experiments did not always favour our expectations, a larger portion of blood being found in the right ſide of the heart, from the ſlight degree of irritability that remains after reſpiration had been ſtopt by noxious air.

Our next attempt was to aſcertain if more blood were found in the lungs of an animal whoſe reſpiration was ſuſpended, and then the collapſe removed by a fluid; than where this ſuſpenſion took place without the removal of the collapſe.

We could deviſe no method to enable us to eſtabliſh this point with accuracy, but ventured however on the following experiment.

EXPERIMENT.

A Rabbit was drowned, and the lungs immediately diſtended with air; after tying up the trachea the cheſt was opened, the pulmonary artery and aorta ſecured, as alſo the trunks of the pulmonary veins. The left ſide of the heart was then opened, the blood removed, and pulmonary veins divided, the ligature was taken from the trachea, and the air expreſſed from the lungs. A large quantity of blood flowed from the pulmonary veins, and in a few minutes, by alternate expanſion and collapſe, the lungs were emptied of their contents. No accurate compariſon however could be drawn between the quantity of blood preſent in this experiment, and that which they contained in the collapſed ſtate; but it was evidently leſs in the latter, which tends to confirm the opinion of the collapſe of the lungs preventing a free circulation through them; for if more blood is found when they are diſtended than when collapſed, this it would ſeem muſt ariſe from the preſence of an obſtruction in the one inſtance, and its removal in the other.

Theſe, together with the former experiments, conſpire to prove that the collapſe forms an impediment to the circulation; for if in an animal that is drowned, hanged or ſuffocated, the blood be found to predominate in the right ſide of the heart, while in another deſtroyed by the ſame means the contrary takes place merely from the introduction of a fluid into the lungs which can have no chymical effect on the blood; from what can this variation and difference of quantity originate, if not from the mechanical obſtruction in the firſt caſe, and its removal in the ſecond?

It ſhould however be obſerved that although repeated experiments prove mechanical obſtruction to exiſt in ſuſpended breathing; yet it muſt be confeſſed that the right ſide of the heart is capable of overcoming in ſome meaſure, this obſtruction, at leaſt for ſome little time after reſpiration has ceaſed, and the left of getting rid of *its black blood*; an opinion that is ſtrongly countenanced by the following experiments.

EXPERIMENT.

A Kitten was drowned, the cheſt immediately opened, and the aorta ſecured, without including the pulmonary artery; when the heart had ceaſed to contract, the quantity of blood in both its ſides was examined, and it was found that the left contained nearly as much as the right.

This experiment was frequently repeated, and ſometimes the quantity of the blood was greater in the left ſide of the heart than in the right; but in all the experiments the diſproportion was leſſened by tying up the aorta.

In the animals therefore ſubjected to theſe experiments, the blood muſt have paſſed through the lungs in the collapſed ſtate; and if no ligature had been applied, this *black blood* would have been propelled into the aorta, ſince the period of examination of the heart after reſpiration has ceaſed, makes no alteration in the proportions.

Theſe experiments afford a reſult in direct contradiction to the opinion ſupported by Dr. Goodwyn, that the left ſide of the heart is incapable of acting from the ſtimulus of black blood: for they prove that whenever the right ſide of the heart is capable of ſending blood through the lungs in the collapſed ſtate, the left is alſo enabled to contract from the ſtimulus of *black blood.*

The ſame experiments may alſo at firſt ſeem to invalidate the opinion that ſuppoſes the preſence of collapſe. But every appearance of objection will vaniſh, if we but reflect that whenever the right ſide of the heart has the power of propelling blood through the lungs in the collapſed ſtate, the quantity is ſo ſmall that it can produce no effect; for we find the lungs contain but very little air, and conſequently under this diſeaſe are nearly in the ſame ſtate as the fœtal lungs; but as only a ſmall quantity of blood in the healthy ſtate of the fœtus, can be propelled through that viſcus, it appears that the blood paſſing through it during the collapſe in the adult, would not be ſufficient for the demand, as very little more blood can be ſent through the lungs after the laſt expiration, than in the fœtal circulation; with this material difference however, that in the latter a change has been given to the blood (in the placenta) while in the other it can receive none.

Now as the left ſide of the heart ſoon ceaſes to poſſeſs a ſtimulus that can enable it to diſcharge its contents; ſo alſo the right can no longer propel blood through the lungs in their *contracted ſtate:* for if the right ſide of the heart continued to ſend blood through the lungs when the left was incapable of getting rid of its own, we ſhould then find the blood predominate in quantity in the left.

Were Dr. Goodwyn's aſſertion true, that after the laſt expiration in drowning, &c. &c. the lungs contain a greater quantity of air than in *hydrops pectoris*, then an objection would ariſe to the ſuppoſition of their collapſe forming an impediment to the free paſſage of the blood; but of the experiments which he imagined authoriſed this concluſion, we have already attempted to detect the inſufficiency.

It muſt however be confeſſed, that Dr. Goodwyn's experiments ſeem ſo ingeniouſly deviſed, and the concluſions drawn from them ſo ſpecious, that at firſt they ſuſpended inquiry; and it was only by ſubſequent examination that we were able to detect the fallacy of thoſe particular ones, which he adduces to aſcertain the quantity of air remaining in the lungs after the laſt expiration. But by purſuing a mode of enquiry different to his, we obtained a reſult extremely unfavourable, and indeed contradictory to his concluſion, viz. that inſtead of the lungs containing a large quantity of air after drowning, hanging, or ſuffocation, the reſiduum is very inconſiderable,

ſiderable, and they are found in a ſtate of collapſe.

To this concluſion ſucceeded an obvious reflection, that if the circulation could be properly carried on during a *collapſe* of the lungs, why ſhould the fœtal circulation differ from that of the adult? and indeed it appears evidently to be the intention of Nature, that only a ſmall portion of blood ſhould ever paſs through the lungs in their ſtate of *collapſe*, for ſhe, ever uniform as wiſe in her operations, would never have provided a different circulation for the fœtus, if the veſſels of its lungs could have admitted through them a free and uninterrupted paſſage to the blood; but as a collapſe of the lungs was neceſſary in the fœtus, it was indiſpenſable for its œconomy, that it be furniſhed with a foramen ovale, &c.

&c. to compenſate for the ſmall allowance of blood that is ſent through them.

In drowning, &c. &c. as very little air remains in the lungs after the laſt expiration, the diſeaſe muſt exhibit nearly the ſame phænomena as the fœtus, whoſe muſcles of reſpiration have not been excited to act; for in this caſe, it is nature that effects what we endeavour to attain by art; that is, to remove the collapſe of the lungs, and this by the introduction of a fluid that will give the neceſſary change to the blood.

Haller, Cullen, and others were of opinion that the ſtate of full inſpiration was as unfavourable to the tranſmiſſion of blood through the lungs, as that of expiration; but this ſuppoſition appears to be but ill-ſupported by fact; for there has been the teſt of experiment to prove, that when the lungs were *completely diſtended by water*, the blood freely paſſed from the right ſide of the heart to the left, and the action of the heart, under this circumſtance, muſt have been feeble, if compared to that which it exerts in a ſtate of health.

It has alſo been the generally received opinion that where the *motion of the lungs* is by any cauſe impeded, the circulation, from want of *their mechanical action*, is alſo ſuſpended; and it is ſuppoſed by Mr. Kite, that the accumulation of blood which takes place in the right ſide of the heart, from drowning, hanging, and ſuffocation, originates from the ſame cauſe.

"As it is generally agreed," ſays Mr. Kite, "that the ſtoppage of the *motion of the* "*lungs* is the firſt internal efficient cauſe

“ of death, let us conſider the effects
“ which reaſon teaches us, muſt inevit-
“ ably follow the ceſſation of that im-
“ portant action. The blood returning
“ from all parts of the body by the ſu-
“ perior and inferior cava, is collected in
“ the right auricle and ventricle of the
“ heart, from whence in a ſtate of health,
“ it is tranſmitted through the pulmonary
“ artery and veins, into the left auricle;
“ but in the preſent inſtance, the *motion of*
“ *the lungs* being ſtopt, only a ſmall quan-
“ tity can paſs through that viſcus.

This opinion of Mr. Kite's has been contradicted by experiment, which proves that from the mere removal of the collapſe, independant of any *mechanical action* of the lungs, the circulation through them was reſtored; whence it is obvious that the accumulation of blood in the right ſide of the heart does not proceed from want of *motion*, but from the *collapſe* of the lungs.

To the oppoſite opinion, however, Mr. Kite ſtedfaſtly adheres; and in order to ground his aſſertion, that the circulation ceaſes in *drowning*, *hanging*, *and ſuffocation*, from want of *motion* in the lungs, and not from their *collapſe*, he has recourſe to analogy, and obſerves, “ that in the action of laughing the lungs are *dilated*, and remain “ almoſt in the ſame ſtate until the cauſe “ ceaſes; but while it continues, the blood “ cannot be tranſmitted freely through the “ lungs; hence we eaſily account for the “ redneſs and ſwelling of the neck, face, “ and head; and if the paſſage through “ the lungs is long impeded, the brain “ ſuffers, and apoplexy enſues, which has “ on many occaſions ended fatally.

“ Caſes have often happened of violent
“ ſtraining and fits of coughing, which
“ are attended with *a full and long conti-*
“ *nued inſpiration*, terminating in the ſame
“ manner; and ſinging or crying produce
“ ſimilar effects, although it ſeldom hap-
“ pens they are carried to any dangerous
“ exceſs. Inſtances almoſt out of number
“ might be brought forward in ſupport
“ of theſe arguments; but enough has
“ ſurely been ſaid to ſatiſfy the doubts
“ of the moſt incredulous, and fix the
“ wavering mind of the moſt incorrigible
“ ſceptic.”

If Mr. Kite's aſſertion were true, that in the act of laughing the lungs are *dilated*, and that coughing, fits of ſtraining, ſinging, &c. are attended with *a full and long continued inſpiration*, this I acknowledge would be ſufficient to impreſs conviction on the mind of every ſceptic that the want of *motion* in the lungs, from whatever cauſe, may prevent the tranſmiſſion of blood from the right ſide of the heart to the left; but inſtead of theſe efforts being, as Mr. Kite ſtates them, acts of *inſpiration*, they are all acts of *expiration*, and we might with as much propriety aſſert, that charging a gun produces the exploſion, as that the acts of laughing, coughing, ſinging, &c. are the effects of *inſpiration*. From long continued expirations, as laughing, coughing, &c. when carried to exceſs, a *collapſe* of the lungs muſt ariſe, and this, by obſtructing the free paſſage of the blood through them, will occaſion an accumulation of it in the right ſide of the heart, from which apoplexies may ſometimes follow. But ſuppoſing the lungs were, as Mr. Kite conceives them to be, in a ſtate of *dilatation*, then apoplexy could never be the conſequence, ſince a free paſſage would be then open to the blood, and prevent the poſſibility of its congeſtion in the head; ſo that Mr. Kite's *efficient cauſe* of death here contradicts *his proximate.*

The argument alſo adduced from analogy, to ſupport the opinion, that the *want of motion* in the lungs ſtops the circulation in *drowning, hanging and ſuffocation*, in reality confutes it, and proves collapſe to exiſt. But had not Mr. Kite ſeemed to conceive that his arguments were ſufficient to ſatisfy the moſt incorrigible ſceptic, we ſhould not have taken ſo much pains in endeavouring to diſprove them. Indeed, as the plan of treatment recommended by Mr. Kite muſt be ſo highly detrimental, if *collapſe* does really exiſt; it appeared of the utmoſt conſequence to determine whether from *it* aroſe the ſuſpenſion of the cirlation, or from the want of *motion* in the lungs.

In drowning and in ſuffocation from foul air, anatomical reſearch has diſcovered that the veins of the head are not more diſtended than in natural death; and that apoplexy does not take place as Mr. Kite ſuppoſes from hanging, is equally obvious; for if ſuch were the caſe, never could we be able to effect a recovery, ſince our endeavours to remove common apoplexy, even while the proceſs of reſpiration and circulation proceed, frequently prove unſucceſsful.

Were it really true that apoplexy took place either in drowning, hanging, or ſuffocation, we ſhould conceive more ſanguine hopes of recovery after breathing had ceaſed in ordinary apoplexy than when it aroſe from drowning, &c. for theſe latter cauſes produce their fatal effect in a few minutes; while common apoplexy, even where a prediſpoſition exiſted, is generally many hours, and ſometimes days before death takes place. If, therefore the two diſeaſes be of the ſame ſpecies, that which ariſes from drowning, &c. muſt be much the more violent in degree. Were this indeed literally the fact, we ſhould then from drowning, &c. find great extravaſation, and no recovery could be effected, and we ſhould have reaſon to expect a recovery in every inſtance, where the cauſe was ſo ſlight as to require ſeveral hours to ſtop the natural actions; but as we are able to recover long after breathing has ceaſed in that diſeaſe, which according to this theory, muſt be the moſt violent, and as we frequently fail of recovering from common apoplexy, even during reſpiration, it certainly proves that this diſeaſe, and that which takes place from drowning, are as eſſentially different as any two diſeaſes to which the human body is obnoxious.

It has been advanced by ſome authors, that the mere diſtention of the veſſels, without any extravaſation either of blood or ſerum, is ſufficient to produce apoplexy, and this is the ſpecies of apoplexy which Mr. Kite conceives to be produced in drowning, &c. as it is acknowledged that no extravaſation takes place in the head; but were congeſtion alone, in theſe caſes, the cauſe of death, then muſt it be ſuppoſed that the diſtention alone of the veſſels acts much more violently than when attended with actual extravaſation; but this is an opinion not only diſcountenanced by probability, but alſo flatly contradicted by Valſalva and Morgagni on the ſtubborn faith of numerous facts. The latter obſerves " that thoſe caſes are the " moſt violent, and much the ſooneſt " mortal, which have their origin from " *extravaſation* within the cranium, we " not only have daily proofs of ourſelves, " but it has alſo been frequently obſerved " by others."

It would therefore appear that though the veſſels of the head were fully diſtended in drowning, hanging, and ſuffocation, this diſtention could not here be conſidered as the immediate cauſe of death, ſince at moſt it can produce but a very mild ſpecies of apoplexy; for even when extravaſation follows, the actions of life generally continue for hours, while in drowning, &c. it is needleſs to repeat, the natural functions are in a few minutes aboliſhed.

There ſtill remains one obſervation, which proves the impoſſibility of apoplexy happening from drowning, &c. and that is, that no accumulation of blood can be formed even at the right ſide of the heart, prior to the commencement of the collapſe of the lungs, but as ſoon as this obſtructs the free paſſage of the blood, then it receives but an imperfect change; and is therefore, in a great meaſure, deprived of its eſſential quality. From this circumſtance it will no longer be capable of keeping up the full and natural action of the heart and arteries; and as the carotid and vertebral arteries will alſo have their action proportionably diminiſhed, the impetus of the blood to the head muſt thereby be checked, and conſiderably enfeebled. Theſe conſiderations make it obvious that apoplexy can only happen where the blood receives its proper ſtimulus from the air to ſupport the action of the heart and arterial ſyſtem, and where an obſtruction exiſts to its free return.

In apoplexy that proceeds from diſtention of the ſtomach, and other cauſes, the blood continues to receive its due ſtimulus from the air; while for want of a ſufficient expanſion of the lungs, (the diaphragm not being allowed a proper deſcent,) an obſtruction ariſes to the free return of the blood, which occaſions the diſeaſe. But even in this ſuppoſition, death might not be the conſequence, at leaſt for many hours, if at all; although the veſſels of the head might have been fully diſtended, and that by the natural action of the carotid and vertebral arteries; but as in drowning, &c. theſe veſſels are ſoon deprived of their wonted ſtimulus, no injury whatever can happen to the brain.

From theſe obſervations, we truſt it has been proved not unſatisfactorily, that apoplexy never happens in drowning, &c. but there is an experiment which muſt always ſuperſede argument that fully diſproves the exiſtence of apoplexy.

This experiment has been mentioned before to prove a different fact; but as it is one that ſerves our preſent purpoſe, the repetition of it will therefore be excuſed.

EXPERIMENT.

The trachea of a dog was laid bare, and ſecured by a ligature, and this was endeavoured to be performed at the inſtant an inſpiration was made; in leſs than four minutes he ceaſed to ſtruggle. On examining the heart we found the quantity of blood in the left, when compared to that of the right as thirteen are to twelve. A portion of the cranium was removed, and the veins of the head were evidently leſs diſtended than *natural.*

Here then there being no obſtruction to the paſſage of the blood through the lungs, it could not be collected in the right ſide of the heart, and conſequently no accumulation was found in the head, and yet this animal died as ſoon as other animals from ordinary hanging; which carries conviction to my mind, that apoplexy forms no part of the diſeaſe.

As a further teſtimony, however, in favour of this opinion, the following experiment was made.

EXPERIMENT.

The two carotids of a dog were ſecured [*], and in half an hour after this operation he was hanged. In leſs than four minutes he ceaſed to move; on removing a large portion of the cranium the veſſels were found much leſs diſtended than in *ordinary death.*

From this experiment it muſt appear obvious, that as the principal ſource of ſupply was cut off; inſtead of the veſſels of the brain being in a ſtate of congeſtion, the quantity of blood they contained muſt have been leſs than natural, and conſequently no ſpecies of apoplexy could follow. Yet this animal died as ſoon as other animals which had undergone no ſuch operation.

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[*] This experiment of tying up the carotids has been made both by Mr. Haighton, and Mr. Cooper, in order to aſcertain the effects, and in every inſtance it appeared to produce no injury whatever to the functions of the animal.

Mr. Kite, "from a variety of circum-
"ſtances, is induced to believe that me-
"phitic air occaſions apoplexy and death
"in two ways; firſt, by affecting the
"nerves of the trachea in ſuch a manner
"as to render the muſcles ſubſervient to
"reſpiration paralytic; and ſecondly, by
"its ſedative property, deſtroying the ac-
"tion of the brain, and nervous ſyſtem."

To the muſcles of reſpiration being rendered paralytic, there are two forcible objections; firſt, that the nerves of the trachea have no communication with the muſcles of reſpiration; and, ſecondly, that if the muſcles of reſpiration were paralytic, no recovery could ever be obtained. Yet Mr. Kite in the next page obſerves, that "ſeveral have been "known to have revived ſpontaneouſly;" which certainly proves, that the muſcles of reſpiration could not have been in a paralytic ſtate.

As to the latter opinion, that apoplexy and death are produced by the ſedative property of noxious air, deſtroying the action of the brain and nervous ſyſtem, it can by no means be reconciled to the idea we have formed of apoplexy; for I believe it is generally agreed that apoplexy muſt happen from *preſſure* on the brain; and we might with equal propriety affirm, that tobacco, and other vegetable poiſons, when taken into the ſtomach, (which actually do produce a ſedative effect on the brain and nervous ſyſtem,) bring on *apoplexy*, as that this diſeaſe is the conſequence of the *ſedative property* of mephitic air. Indeed it appears ſomewhat ſtrange, that Mr. Kite, who has paid ſo much attention to apoplexy, ſhould have imagined that this diſeaſe could ever be produced by the immediate effect of any *ſedative*.

We alſo diſſent from Mr. Kite in opinion, that a *full inſpiration* is ever made in foul airs; for although animals when immerſed in ſuch a medium, may have been heard to cry, yet this affords no proof that a full inſpiration has been previouſly made. This is not an uncommon circumſtance in drowning animals, found ſound being the immediate act of an *expiration*; and there can be no doubt but all animals have a quantity of air in their lungs when immerſed in a noxious medium. But as ſoon as the animal on inſpiration becomes ſenſible of its deleterious influence, it endeavours to expire; and to this endeavour an attempt ſucceeds to inſpire, when the ſame ſenſation recurs as permits very little air to paſs into the lungs.

Dr. Crawford's experiments evince, that when an animal is placed in a warm medium, the venous blood becomes nearly florid.

With a view to aſcertain if an animal could be drowned, and the blood in the left ſide of the heart ſtill retain a florid appearance, the following experiment was made.

EXPERIMENT.

A kitten was immerſed in a warm medium, a little above its own temperature, and permitted to breathe under a large glaſs-bell for twenty-four minutes; it was then drowned in the ſame medium.

On opening the cheſt, it was found that the blood in both ſides of the heart was ſomewhat florid, and yet this animal died, which, however, according to Dr. Goodwyn, ſhould not have happened. But why this animal did die, can be readily explained; for the collapſe of the lungs was here of courſe the ſame as in common drowning, and from it aroſe the *immediate cauſe* that ſuſpends the circulation; but there was ſtill another power operating upon this animal to deſtroy life; for from the intenſe heat and denſity of the medium in which the animal was placed, it was compelled to have recourſe to the proceſs of generating cold, in order to reſiſt this exceſſive ſtimulus; and the act of repelling heat invariably renders the powers of the animal leſs ſuſceptible of action: moreover, the power of generating cold by *evaporation*, was here denied. Notwithſtanding, therefore, that the blood in the left ſide of the heart might be florid, yet the ſuſceptibility of action being feeble, the quality of this blood was inſufficient to ſupport irritability.

It is worthy of remark, that in this and in every ſimilar experiment, the heart had leſs action than uſual, although the blood had this florid appearance; which clearly demonſtrates, that much heat diminiſhes

irritability,

irritability, and this effect is probably produced by the quick action which exceſſive heat invariably excites, and the debility conſequent on the endeavours to reſiſt heat. Hence it muſt appear evident, that although the blood might poſſeſs latent heat in abundance, and what in health would have been a proper ſtimulus, yet from the ſolids not being ſuſceptible of action, life could not be ſupported. The *ultimate effect* of all violent ſtimuli muſt be that of a *ſedative*; thus heat (which is one of the moſt powerful ſtimuli in nature) when applied to a certain degree, acts as a ſtimulus; but if this be carried to exceſs, the final effect will be extreme *debility* and death. This is likewiſe the effect of the uſe of ſpirituous liquors, &c. a certain quantity will produce a ſtimulating effect, without diminiſhing the powers of the animal; but increaſe it beyond this, and *debility* will be the conſequence.

It has been ſeveral times remarked, from the reſult of repeated experiments, that where the collapſe of the lungs was removed after breathing had ceaſed, the circulation went on freely through the lungs, and diſtended the left ſide of the heart; but when the collapſe exiſted, the left was not diſtended, which evidently proves that the *collapſe of the lungs is the immediate cauſe of the ceſſation of circulation*; and not as Dr. Goodwyn ſuppoſes, *the preſence of black blood in the left ſide of the heart*; nor, as Mr. Kite imagines, *from want of motion in the lungs.*

We do not, however, eſtabliſh the collapſe of the lungs as the *proximate cauſe* of the *diſeaſe*; for by the term *proximate* *cauſe* is generally underſtood, that which on being removed, the diſeaſe ceaſes. If this definition of a proximate cauſe be adopted, then mechanical obſtruction in the lungs from collapſe cannot of *itſelf* be conſidered the *proximate cauſe*; as by the removal of the collapſe, the right ſide of the heart is merely enabled to empty itſelf, and, by the vis à tergo, to produce an action in the left. But before the proceſs of circulation can be completed, the animal muſt be provided with blood poſſeſſing an increaſed quantity of latent heat, as not only the left ſide of the heart, but the whole ſyſtem wants blood of this quality; ſince in the foetal circulation, the change is received before it reaches the heart, and both ſides have a like ſtimulus. As the heart, however, in the adult muſt be the origin of circulation, ſo it is neceſſary that the alteration ſhould be made immediately,

diately, before the blood enters one of theſe cavities; whereas in the foetus, the heart not being the origin of circulation, the change is given to the blood before it arrives at that organ.

There would appear a more ſtriking impropriety in ſaying, that *the black blood in the left ſide of the heart and arterial ſyſtem was the proximate cauſe of the diſeaſe*, as *this blood* cannot be changed until it has run the courſe of the circulation, and returned to the lungs; but that cannot be effected without a previous removal of the obſtruction formed by the *collapſe*, and exciting the left to contract on its *black blood*; and even if the neceſſary change could be given during the exiſtence of *collapſe*, the lungs could not allow a ſufficient quantity of blood to paſs through them, to keep up the natural functions of the animal.

To us, therefore, the *proximate cauſe* of that diſeaſe produced by *drowning*, *hanging*, and *ſuffocation*, appears to be *mechanical obſtruction in the interior pulmonary veſſels from collapſe of the lungs, with a want of latent heat in the blood*; for remove this collapſe, and induce the neceſſary change on the blood, and you cure the diſeaſe.

Having thus far attempted to eſtabliſh the proximate cauſe, we are naturally led to enquire into the uſual remedies employed in this diſeaſe; and to ſelect ſuch as appear to be the beſt calculated to produce a ſalutary effect.

SECTION VII.

Effects of emetics in ſuſpended reſpiration.

THE proximate cauſe that reſults from the ſuſpenſion of reſpiration in drowning, hanging and ſuffocation, we have ſuppoſed to be mechanical obſtruction in the lungs, with a decreaſe of ſtimulus in the blood. The remedies employed to remove it are as numerous and different as the theories advanced to explain it; but of them all, emetics, with which we begin, are perhaps the moſt ineffectual; their adminiſtration muſt even be attended with no inconſiderable injury, if had recourſe to before the action of the vital functions is reſtored, and even then ſhould be regulated by a ſerious and vigilant regard to particular circumſtances.

No ſalutary effects can be expected from vomits, but in caſes where the proceſſes of reſpiration and circulation have been re-eſtabliſhed, and where enquiry informs us that the ſtomach has been overburdened either with food or ſpirituous liquors. In theſe caſes there may be no impropriety in emptying the ſtomach to facilitate the deſcent of the diaphragm in inſpiration; but to *commence* by the exhibition of emetics muſt be highly improper, as the action and energies of the heart, from its ſympathy with the ſtomach, muſt thereby be conſiderably debilitated. And even admitting no ſuch debilitating effects took place, every attempt to empty the ſtomach muſt neceſſarily be futile until the nervous energy be reſtored in a very ſenſible degree, when they may be exhibited to more advantage.

To aſcertain, however, with ſome degree of preciſion, the effects of a powerful emetic, the following experiment was made.

EXPERIMENT.

A Puppy was drowned, and after all ſtruggling had ceaſed, one drachm of emetic tartar diſſolved in two ounces of water, was injected into its ſtomach. The lungs were then inflated, and other means of recovery employed, until the animal made an effort to inſpire; ſoon after which it appeared perfectly recovered.

In ſeven minutes from its apparent recovery it began to vomit; in twelve to purge, and continued frequently to vomit and purge for one hour and ſeventeen minutes, when it died.

On examining the ſtomach, it was found empty, but without the ſmalleſt appearance of inflammation.

As a recovery was effected in this animal where ſo ſtrong a doſe of poiſon had been adminiſtered, and that without producing any inflammation, it was deemed requiſite to introduce the ſame quantity of emetic tartar into the ſtomach of another puppy during the healthy actions of the animal, in order to determine if the effects were ſimilar.

The experiment was made in the following manner.

EXPERIMENT.

Into the ſtomach of a Puppy of the ſame litter as that of the laſt experiment, was introduced one drachm of emetic tartar, while its natural actions remained unimpaired; in two minutes it appeared faint, in leſs than four vomited; in eleven purged, and in fifty-three minutes died.

The ſtomach, as in the laſt experiment, was found empty, but the *whole internal coat was nearly in a ſtate of gangrene.*

The reſult of theſe experiments exhibits a truly remarkable circumſtance, that an animal ſhould be drowned, afterwards have poiſon injected into its ſtomach, and yet be recovered and continue to live longer than another of the ſame order and age, that had received the ſame quantity of poiſon in full health; it tends however to evince and aſcertain one fact, that medicines introduced into the ſtomach do not produce the ſame effect when reſpiration and circulation are *ſuſpended*, as when *theſe functions* are duly carried on: and this circumſtance ſomewhat accounts for a phenomenon which to me appears extraordinary, that a recovery ſhould ſometimes be effected, even after emetics, tobacco, &c. have been adminiſtered in quantities ſufficient utterly to deſtroy the life of the ſame ſubject, if given in full health.

It may however at firſt be doubted, whether medicines that poſſeſs a ſedative property, like tobacco, would not produce their greateſt effect on an animal whoſe powers were weakeſt, and conſequently deſtroy the irritability of an animal already debilitated by drowning, &c. much ſooner than an animal, the vigour of whoſe powers remained undiminiſhed.

To aſcertain this point the following experiment was made.

EXPERIMENT.

A Puppy of about a fortnight old was drowned, and after all motion had ceaſed, a ſtrong infuſion of tobacco (one drachm to two ounces of boiling water, and ſuffered to cool) was thrown into its ſtomach; the uſual means of recovery were then employed: in fifteen minutes it made an effort to inſpire, and ſoon breathed tolerably well, but in leſs than ten minutes after, it died.

EXPERIMENT.

An equal quantity of an equally ſtrong infuſion of tobacco was introduced into the ſtomach of another Puppy of the ſame age; it immediately fell motionleſs on the ground, and in leſs than four minutes expired.

Theſe experiments ſeem to prove that, whether medicines have a powerful ſtimulant or narcotic quality, their effects are *diminiſhed* in proportion as the powers of the animal are *decreaſed*.

That medicines however do produce ſome effect before reſpiration is reſtored, has been confirmed by the following experiments.

EXPERIMENT.

A ſmall Puppy was drowned, and the cheſt being immediately opened, the heart was obſerved to contract ſtrongly. Six drachms of laudanum was thrown into its ſtomach, and there followed almoſt an inſtantaneous diminution of the action of the heart.

This experiment was repeated, by injecting white vitriol, emetic tartar, infuſion of tobacco, &c. into the ſtomach, at a time when the heart was expoſed to view; and theſe were alſo found to check the force and frequency of its contractions, but particularly tobacco. As it therefore appears that in this diſeaſe ſympathetic effects continue to ariſe from the application of impreſſions to the ſympathiſing organs, it will at once appear obvious, that any medicine introduced into the ſtomach which is likely to leſſen the power of the heart, muſt be attended with conſequences highly detrimental; and that brandy, on the contrary, or any other warm cordial, which is known to increaſe the action of the heart, (probably in theſe circumſtances without diminiſhing its power) ſhould only be employed.

To confirm this opinion, we proceeded to the following experiment.

EXPERIMENT.

A Dog was hanged, and the heart being expoſed to view, one ounce of brandy was thrown into its ſtomach, the actions of the heart were ſoon quickened, and each contraction appeared more forcible than before the exhibition of this ſtimulus.

This experiment we frequently repeated, by increaſing the quantity of ſpirit to ſix ounces and upwards, and it was found that ſo large a quantity quickened the actions of the heart extremely, but they were feeble and of ſhort duration.

From theſe experiments, however, we can draw only this inference, that a ſmall quantity of ſpirits here increaſed *both the power and action of the heart*, while a large quantity quickened the *action*, and *exhauſted the powers.* But the analogy will not hold good with the human ſubject in this particular inſtance; for as the ſtomach of the brute is not accuſtomed to receive ſo ſtrong a ſtimulus as that of brandy, its effects will be different *in degree.* Indeed, from obſerving that all medicines produce a leſs effect after reſpiration has ceaſed, than during health; it is probable that ſix, or even eight ounces thrown into the human ſtomach would not increaſe the action of the heart beyond its powers, and thus a cordial of ſome kind becomes one of the neceſſary remedies in this diſeaſe.

SECTION

SECTION VIII.

Effects of bleeding.

WE do not conſider bleeding as a dangerous remedy in every caſe of ſuſpended reſpiration from drowning, hanging and ſuffocation; and were it poſſible to take blood from the part where we know it ſuperabounds, bleeding would prove one of the moſt immediate and efficacious means of recovery.

The right ſide of the heart has been found to be loaded with blood. This univerſally obtains in this diſeaſe; and we mentioned one or two inſtances in particular, where we had an opportunity of obſerving that the heart ceaſed to act from over diſtention: but that when relieved from a portion of its burden, its contractions were immediately renewed.

If therefore from the right ſide of the heart, while thus in a ſtate of violent plethora, a ſmall quantity of blood could be taken; experiment and obſervation tell that its power and actions would be inſtantly reinvigorated.

But as this lies beyond the reach of art; the taking of blood from any other part of the body can rarely ever be productive of any advantage, as there is ſeldom preſent in the ſyſtem a greater quantity of blood than is neceſſary to the due ſupport of the circulation. The diminution of this quantity muſt conſequently be attended with hurtful effects.

From bleeding, therefore, as a general remedy, little advantage can be expected; nor can it be employed with ſucceſs but in ſuch caſes, where, from an acquaintance with the complexion and habits of the patients, we may preſume that previous to the accident or diſeaſe, a general plethora prevailed.

It may then be ſerviceable to diminiſh the exceſs of blood that loads the ſyſtem; for when the right ſide of the heart has got rid of its preſent burden, if an accumulation of blood preſſes in every direction on the orifices of the two cavæ, and thence on the right auricle, it muſt tend not a little to enfeeble or wholly deſtroy its action.

Mr. Kite obſerves, that in the tonic temperament, every circumſtance concurs which can contribute to the action of the heart and arterial ſyſtem, and he immediately after adds that "ſuch people are "alſo in a ſtate very nearly allied to a "plethora; hence the blood circulates with "ſuch force as to occaſion hæmorrhages "from many parts of the body." In this opinion we cannot coincide with Mr. Kite, as the tonic and plethoric temperaments appear very different; for whenever plethora is preſent, *debility* muſt be the conſequence, there being a greater quantity of blood in the ſyſtem, than can permit the animal to take on the tonic temperament.

On this ſtate of the body ſome light may perhaps be thrown, by comparing it with a diſeaſe to which young women are frequently expoſed, viz. a difference of temperament producing a ſuppreſſion of the menſtrual diſcharge. The obſtruction may ariſe either from the preſence of too much or too little blood in the ſyſtem; and yet both ſtates may be properly called the atonic, though for the relief in theſe caſes oppoſite remedies be employed; for in both there is relaxation, inactivity and want of power in the ſolids. In the firſt inſtance we bleed and vomit, by which means the heart and arteries, from having a leſs burden to propel through the ſyſtem, will act more forcibly. In the latter caſe we do every thing to increaſe the volume of blood, a due quantity of which increaſes the action, and ſtrengthens the energy of the heart and arterial ſyſtem. By this it would appear a certain quantity of fluids is requiſite to the ſupport of the proper action of the ſolids; but any thing above or below the ſtandard, will produce

debility.

debility. It in the firſt caſe it may be called *indirect*, in the other *direct debility*.

Bleeding then ſhould be only employed where the fluids appear too abundant. When the operation is to be performed, I concur with Mr. Kite in adviſing the blood to be taken rather from one of the jugulars; not however that we expect with Mr. Kite that much advantage is gained by taking blood from the head after drowning and ſuffocation; but as there is here a nearer connection with the ſuperior cava, the heart would ſooner be relieved, than where it is drawn from the arm.

When blood letting is deemed neceſſary, it is one of the firſt means of recovery to which we ought to have recourſe.

The propriety however of bleeding muſt in every caſe be decided by the medical aſſiſtant; and as we cannot take away blood from the heart itſelf, it will moſt frequently be found that the quantity of blood in the ſyſtem is not ſo great, as to impede the circulation, and conſequently the quantity to be taken away ſhould probably never exceed ſix ounces.

Blood letting may with advantage be employed where, previous to the diſeaſe, the heart might be ſuppoſed to have acted more freely from ſuch an operation; but where its powers of action were already feeble, this remedy muſt neceſſarily be productive of infinite miſchief; for if there is not ſufficient blood in the ſyſtem to furniſh a freſh ſupply to the right ſide of the heart at each diaſtole, inſtead of promoting the good effects of the other remedies, it may totally fruſtrate or at leaſt retard them.

After hanging however, there will be a much more frequent occaſion for blood letting, than after drowning or ſuffocation; ſince the cord muſt in ſome meaſure prevent the free return of blood by the veins; and although we have endeavoured to prove that apoplexy can never happen, yet in theſe caſes as there is more than the natural quantity of blood in the head, it may be of ſervice to leſſen it; but the quantity of blood in the head will much depend on the weight of the patient; and as bulk, weight, and general plethora frequently are united in the ſame perſon, bleeding becomes here indiſpenſably neceſſary; whereas, if the patient be tall and thin, the diſtance from the heart to the head conſiderable, and the ſyſtem rather to want blood, bleeding, even in caſes of ſuſpenſion, would perhaps do more miſchief, by debilitating the ſyſtem, than advantage could be gained, by relieving the local plethora of the head and heart; for if the removal of the local plethora tends to increaſe the general debility, this laſt diſeaſe is more dangerous than the one we endeavour to remove.

We ſhall next enquire into the effects of electricity, together with thoſe of artificial reſpiration, both ſingly and combined.

SECTION IX.

Effects of Electricity and Artificial Reſpiration.

FROM electricity, as it has hitherto been recommended and employed, conſiderable indeed muſt have been the miſchief that enſued. Agreeably to the method that was to direct its application, it was to be adminiſtered as a local and general ſtimulant, to be tranſmitted through every part of the body, the heart, brain and ſpinal marrow, and in all caſes where electricity was the remedy principally relied on, it ſeemed to ſuperſede moſt of the other curative operations, but particularly that of expanding the lungs. From attending however to the nature of the diſeaſe produced by ſuſpended reſpiration in drowning, hanging, and ſuffocation, it will evidently appear, that ſtimulating the heart, without at the ſame time endeavouring to remove the obſtruction of collapſe, muſt be one of the moſt ill-judged and moſt dangerous plans of recovery.

I repeat, there is mechanical obſtruction in the lungs from collapſe. This alone points out the danger of ſtimulating the heart, when there exiſts a cauſe that muſt impede its action; we are deſtroying its irritability, without deriving any advantage, as the circulation can go on to no effect, unleſs the obſtruction in the lungs be firſt removed.

We are, by this plan of treatment, abſolutely taking away life.

Mr. Kite conceiving *that the ſtoppage of the motion of the lungs* was the immediate cauſe of ceſſation in the circulation, and that the lungs were not in a ſtate of *collapſe*, was led to recommend ſhocks of electricity to be paſſed through the heart, &c. without the lungs being at the ſame time expanded. In his eſſay he adviſes that artificial reſpiration, as well as electricity, ſhould he frequently *interpoſed*, and that when the body is electrified *all the other operations ſhould ceaſe*.

As it has been proved by experiment, that in this diſeaſe the lungs are in a ſtate of *collapſe*, and that the circulation is ſtopped from this cauſe, and not from the want of *motion* in the lungs; it appears obvious, that Mr. Kite's mode of treatment muſt be highly detrimental. Had this gentleman entertained the ſmalleſt ſuſpicion of a *collapſe* exiſting, I am perſuaded he never would have recommended the ſtimulus of electricity to be applied to the heart during ſuch a ſtate of the lungs; but have concurred with me in opinion, that ſuch a practice was more likely to deſtroy, than reſtore the actions of life. When electricity has been employed, the lungs have ſometimes been firſt expanded and *collapſed*, and ſhocks then paſſed through the heart, brain, and ſpinal marrow, but in this caſe the lungs being alſo contracted, every electrical ſhock muſt diminiſh the power of the heart. Artificial reſpiration is again employed without electricity, but this ſecond effort promiſes leſs probability of ſucceſs than the firſt; for the heart having before received a ſtimulus, ſo great as that of electricity, it is not likely that the minor one viz. that of the mechanical action of the

lungs,

lungs, ſhould have the ſmalleſt effect. And as the heart may not naturally act more than once or twice in a minute, there are many chances to one that theſe contractions do not happen at the inſtant the obſtruction is removed.

Inflating the lungs, and immediately after preſſing the cheſt, is ſaid to be imitating natural reſpiration, but it appears evident, that this mode of proceeding is very improper, if the heart has not been excited to action during the expanſion of the lungs.

Neither is this proceſs an imitation of nature, for in health, the lungs always contain a quantity of air, and we only expel a little, and receive in proportion. But if we diſcharge all the air as ſoon as received, it is probable, that the heart may act, when the lungs are contracted, and which action can produce no ſalutary effect.

Whatever view the operator may have, who purſues this plan of treatment; whether he ſuppoſes a change to be produced *in the blood, within the auricle,* or whether he expects to propel the blood within the lungs into the left ſide of the heart, he will be equally diſappointed. For we have obſerved, that no change can be produced in the trunks of the pulmonary veins; and we have alſo found that if any alteration in the quality of the blood be made within the lungs, there is not ſufficient quantity remaining for their mechanical action to propel this blood into the left auricle.

The advantage we may expect from inflation, is this; *that the right ſide of the heart may act at the ſame time the lungs are diſtended;*

diſtended; but ſurely ſuffering them to collapſe, as ſoon as inflated, is very unlikely to enſure ſucceſs, when the heart has not been ſtimulated by electricity during the expanſion of the lungs. Moreover, as the air can only become vitiated, by the action of the heart propelling blood into the lungs, there appears no neceſſity of performing a complete expiration after every inſpiration, unleſs electricity has been at this inſtant employed.

The plan of treatment neceſſary to be purſued is obviouſly this. We ſhould *firſt expand the lungs, and when the collapſe is removed, ſtimulate the heart by a ſhock of electricity. The heart from this is made to contract, there is a free paſſage for the blood, and air in the lungs to produce a change*; therefore if any irritability be left in the heart, ſome blood muſt enter the lungs. We now perfectly collapſe them, and of courſe this blood will be conveyed into the trunks of the pulmonary veins and left auricle, and the circulation will go on. The lungs are again immediately diſtended, and kept ſo, until another ſhock be paſſed as before.

Here then it is neceſſary, that all the air ſhould be expelled as ſoon as the heart has been made to act; ſince this air may have loſt the greater part of its purity. But as the irritability of the heart is ſeldom ſuſceptible of action, from the ſmall ſtimulus of inflation; this practice can never be proper where electricity is not employed.

It has been obſerved, that the heart of ſome animals in ſuſpended reſpiration, has for a time the power of overcoming this obſtruction by its own ſtimulus, without removing the collapſe; and probably in man, the heart may poſſeſs a ſufficient degree of irritability to perform the ſame functions on being ſtimulated by electricity, agreeable to Mr. Kite's plan. But without conſidering the powerful ſtimulus, required to effect this, and the debility which muſt neceſſarily enſue; let us enquire, what advantages can be poſſibly gained by propelling blood from the right ſide of the heart to the left, during the collapſed ſtate of the lungs. Allowing this could be effected, there is no air in the lungs to produce any chymical alteration on the *quality* of the blood; and were the left auricle and ventricle, in part emptied and again diſtended with a fluid equally foreign to the wonted ſtimulus, their power muſt every time be diminiſhed, and conſequently the right, at each contraction, require a ſtronger ſtimulus to produce the ſame effect; when as the left finding an increaſing difficulty in propelling its contents; the right would be leſs capable of overcoming the collapſe.

This power therefore could only continue for a ſhort time, and during its exiſtence no better effect could be produced from blood paſſing through the lungs *without receiving a change from the air*, than when propelled from any other artery into a vein by friction.

If no electrical machine can be procured, the manner of carrying on artificial reſpiration ſhould be altered; the lungs are to be expanded; and, inſtead of compreſſing the air out as ſoon as received, they are to be kept in a ſtate of moderate expanſion for about a minute; ſo that if the heart acts during this period, there may be no obſtruction to the paſſage of the blood.

To effect this, repeated inſpirations are requiſite, allowing at each time the ſuperfluous air to eſcape before the lungs are made to *collapſe*, that there may be in ſome meaſure a freſh current of air. By this means the ſurface of the lungs will at each inſpiration be thruſt againſt the heart; and if part of its irritability is loſt, ſo that this ſhall not act as a ſtimulus; ſtill when the heart does act, there will be air to give the change, and *no impediment to the paſſage of the blood.*

It was obſerved that the lungs in ordinary reſpiration have no active power in propelling blood through them in health. But it ſeems in the recovery they may aſſiſt by their action; for when the heart poſſeſſes only power ſufficient to ſend blood within the lungs, without being able to propel it to the left heart, producing an *artificial collapſe* under theſe circumſtances will empty the interior pulmonary veſſels of the blood they have received, and excite the left auricle and ventricle to contraction. That the lungs will here produce this effect, there can be no doubt, ſince we find a greater quantity of blood in them when diſtended than collapſed; and hence by compreſſing the lungs, they muſt act upon all the blood they have received ſince the laſt expiration.

Care however ſhould be taken, that the collapſe is never ſuffered to *continue*; for the heart may act at this period and *then* without effect; ſo that the act of inſpiration in every inſtance ſhould be performed immediately after the laſt complete expiration.

During the whole proceſs of the treatment, from the firſt attempt to effect a recovery, the lungs ſhould never be ſuffered to remain collapſed, that other curative means may be employed. Without this precaution, we render abortive all our endeavours to remove the cauſe of the diſeaſe; for this end not previouſly attained, what rational hope or dependance can be placed in the application of any remedy?

Inſtances of recovery have not been wanting where the lungs were not inflated; but in ſuch it muſt be attributed to an unextinguiſhed energy of the living principle, which continued in ſome degree to enable the muſcles of inſpiration to act ſo as to afford admittance to a portion of air.

Does it not appear probable that the difference of ſucceſs which marks the caſes reported by the Humane Society, in which the ſame method of cure was obſerved; may depend in a great meaſure on the heart's acting, or not acting during the *expanſion* of the lungs? Some patients were irrecoverable after reſpiration had been ſtopped for only one, two, and three minutes; whilſt the recovery of others who had remained more than half an hour under water was effected by a ſimilar mode of treatment.

The variation of the degrees of irritability in the ſame order of animals is found to be conſiderable; but it appears improbable, that one ſhould be deſtroyed from a cauſe which, thirty times multiplied is inſufficient to take away life from another apparently under the ſame circumſtances. Having been preſent at ſeveral caſes of drowning, (in the character of ſpectator,) we had occaſion to obſerve one in particular, in which, though the body had not been long under water, yet all the endeavours to reſtore life proved unſuccefsful. The failure of ſuccefs however in this unfortunate caſe was evidently occaſioned by the means and method purſued to obtain a recovery. The ſmoke of tobacco blown up the rectum, frictions, and inflations of the lungs were firſt employed for about ten minutes, when the two latter were ſuſpended to allow the adminiſtration of electricity. This ſtimulus was applied by paſſing ſmart ſhocks through the heart, brain, and ſpinal marrow; in fact the whole body was electrified. The muſcles through which it was conducted contracted powerfully. The ſhocks were repeated with ſanguine hopes of ſuccefs, but the contractions gradually became more feeble, and in about two hours were totally aboliſhed.

Artificial reſpiration, with frictions, was again attempted, but to no effect. It is obvious that in this caſe a conſiderable degree of the vital energy was preſent, but abſolutely deſtroyed by the means employed to re-eſtabliſh it; for as the proximate cauſe of the diſeaſe was not removed, every increaſe given to the action of the heart muſt have produced debility. But had the collapſe of the lungs been taken away when the heart had been ſtimulated, far different indeed might have been the effects; no impediment would then have exiſted to the paſſage of the blood through the lungs, and it would have imbibed from the air its neceſſary portion of heat.

Inflating the lungs and electrifying the heart at the ſame inſtant, may at firſt view be thought a difficult and embarraſſing proceſs; but it will be found that proper inſtruments, conſtructed for the purpoſe, will make this as eaſy, if not more ſo, than what are now employed.

It will be neceſſary, however, firſt to conſider the improvements that have been made, and the diſadvantages that ſtill attend them.

Mr. Kite has formed a very compact caſe of inſtruments for the purpoſe of inflating the lungs, but not without their inconveniences. They are directed to be thus employed.

" A proper perſon ſtationed at the head
" of the body to be operated upon, paſſes
" the appropriated end of a tube into one
" of the noſtrils, and ſuſtaining it there
" with the fore finger, compreſſes both
" noſtrils ſo firmly between the thumb

“ and middle ſinger of the ſame hand,
“ that no air can paſs otherwiſe than by
“ the tube, and the other extremity of
“ the tube being applied to his mouth, he
“ blows with force through the pipe into
“ the noſtrils of the ſubject.

“ The medical director ſtanding at the
“ right ſide of his charge, muſt keep the
“ mouth perfectly cloſed with his left
“ hand, while with his right, making a
“ ſuitable preſſure on the prominent part
“ of the wind pipe, he prevents the air
“ from paſſing into the ſtomach, till find-
“ ing the lungs are properly diſtended,
“ he is to preſs ſtrongly upon the cheſt,
“ removing at the ſame time his left hand
“ from the mouth, ſo as to let the air
“ paſs out; when by this means the lungs
“ are compreſſed the proceſs is to be re-
“ peated, that, as far as can be, the

" manner of natural reſpiration may be " imitated."

We have obſerved before, that *collapſing* the lungs as ſoon as diſtended, is not imitating natural reſpiration; beſides it appears evident that air blown from the mouth of another muſt be highly improper, as being robbed in ſome meaſure of its purity; and if a pair of bellows be uſed, it will employ three perſons, one to inflate, another to ſecure the noſtrils and mouth, and a third to preſs on the cricoid cartilage, and cheſt in expiration; and it ſeems that unleſs all three perform their reſpective offices in perfect concord, the artificial reſpiration will be very imperfect.

There are alſo two diſadvantages attending every inſtrument introduced into the noſtrils; firſt, the epiglottis obſtructs the free paſſage of the air; accordingly, part of the air thus repelled enters the ſtomach, which cannot be prevented by preſſing on the cricoid cartilage; for although preſſure applied here may prevent moſt liquids from paſſing, yet ſo ſubtle a fluid as air blown with force may make its way into the ſtomach; not that air is ſuppoſed to produce miſchief from its quality, but from the mechanical effect it muſt have in preventing the lungs from expanding. We know the detriment which reſpiration in health receives from a diſtended ſtomach, by its preventing the proper deſcent of the diaphragm in the act of inſpiration; for the other muſcles not being able of themſelves ſufficiently to enlarge the cheſt, the right ſide of the heart is prevented from acting with its uſual eaſe; and hence a diſtention of the ſtomach from air muſt be attended with the ſame effect *.

Mr. Hunter has contrived a double pair of bellows with two valves, ſo that one ſhall perform the office of inſpiration, and the other that of expiration, and theſe are adapted to an inſtrument which is to be introduced into the trachea, after bronchotomy has been performed.

This is certainly a moſt excellent contrivance, but from want of portability, they have rarely been employed.

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* From want of proper inſtruments I once ſaw the ſtomach, and the whole inteſtinal canal very much diſtended, and a rupture under which the patient laboured, was alſo conſiderably enlarged; but the major part of the air may at any time be diſperſed, by preſſing on the abdomen.

Dr. Monro has invented an inſtrument to be introduced into the trachea, in the form of a common male catheter. This is mentioned by Mr. Kite; but its uſe is only recommended on particular occaſions, and it would ſeem that the inſertion of this inſtrument into the windpipe, could not anſwer the purpoſe ſo well as at firſt might be expected; for when introduced, the inferior orifice would be thruſt againſt one of the ſides of the trachea, and the curve preſſing on the other, would form an obſtruction to the air.

There alſo ariſes a great difficulty in introducing this inſtrument, more eſpecially to thoſe who have not been in the habit of employing it, as no guide can be given, by which we may know whether it be inſerted into the larynx or pharynx; and as the aperture of the latter is ſo much larger than that of the former, it would rather glide into the œſophagus, than into the trachea, and thus inflate the ſtomach inſtead of the lungs. The ill conſequences ariſing from ſuch a miſtake are ſufficiently obvious; and to guard againſt ſo fatal an error the following inſtrument is recommended.

As it has been deemed requiſite to introduce ſome ſtimulating cordial into the ſtomach, a vegetable bottle (Fig. 7.) is contrived for this purpoſe, which is to be attached to the flexible tube, (Fig. 6. at B.) and introduced down the œſophagus, and on this tube is placed a conical piece of ivory, (CC) that is moveable, to ſerve as a director for the introduction of the pipe into the trachea.

The vegetable bottle being filled, the tube is to be inſerted three or four inches

into

into the œſophagus, and the conical piece of ivory is then to be carried onward by the aſſiſtance of the fore-finger, ſo as to cloſe the ſuperior aperture of the œſophagus.

Having proceeded thus far, the tongue is to be brought as forward as poſſible, and the inferior end of the curved pipe (Fig. the 1.) paſſed to the farther part of the mouth, until it meets with the ivory director. The pipe being then brought a little forward, the ſuperior extremity is to be elevated, by which means the inferior will be depreſſed, and with eaſe enter the trachea: for as the entrance of the œſophagus is ſituated immediately behind the larynx, and as the pipe is prevented from entering here by the ivory director, it muſt paſs into the air-tube; ſo that the vegetable bottle, and its appendages anſwer a double purpoſe, that of injecting fluids into the ſtomach, and as a guide to the introduction of the other inſtrument.

* The pipe for the trachea is much larger and longer than Mr. Kite's, and made nearly on an oppoſite ſcale, viz. the great curve is given to the ſuperior, inſtead of the inferior part; from which reſults this advantage, that when it is fixed in the trachea, it will be nearly in a ſtrait line with that tube; and for the more eaſy introduction of the inſtrument, the pipe is made conical, and that there may be no impediment to the paſſage of the air, two lateral openings are made at the inferior extremity (B.)

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* It may perhaps be adviſeable, that the ivory director be continued in the œſophagus during the whole proceſs of the treatment, as this will effectually prevent any air from regurgitating into the ſtomach.

The application of theſe inſtruments can not be ſuppoſed to embarraſs any profeſſional man; if however, any impediment ſhould prevent the inſertion of the pipe into the air-tube, bronchotomy ſhould be immediately performed; but the place, and manner of performing this operation, agreeable to the method generally recommended, do not appear the moſt eligible.

We are adviſed by authors, to begin it by a longitudinal inciſion, three or four rings below the cricoid cartilage, and when the trachea is met with, to divide it between the rings.

The performance of this operation, according to this plan, can ſcarce be attended with danger, when attempted by a ſkilful anatomiſt; but it may be embarraſſing to a medical aſſiſtant, who is obliged haſtily to perform it when perhaps he may not perfectly recollect the ſituation of the veſſels; and it is to be remembered that haſte is always particularly neceſſary on theſe occaſions. Allowing however, that the operation is ably performed, great inconvenience muſt follow from the ſituation of the wound; for in the recovery of the drowned, hanged, and ſuffocated, the head is, and always ought to be, kept a little elevated, the conſequence of which muſt be, that the aperture in the trachea then becoming the moſt depending part, the flow of blood that follows the operation will principally enter it, and thus prevent artificial reſpiration from being properly carried on. This is not a theory founded on hypotheſis, but on facts; as we have ſeen two caſes wherein this accident actually happened.

An other inconvenience attendant on this mode of operating is, that from the trachea at this part being covered by ſo much integuments, the pipe for inflating the lungs, cannot be properly ſecured; and ſhould a recovery be effected, the patient muſt be under the neceſſity of keeping his chin directed conſtantly downward, in order to approximate the cartilages, a poſition that is not only very diſagreeable, but to be continued almoſt impracticable.

In order therefore to render the operation more ſimple, leſs dangerous, and to prevent blood from entering the air-tube; I conceive it more eligible to divide the thyroid cartilage: and that inſtead of the inciſion firſt being longitudinal, and then tranſverſe, both the integuments and cartilage ſhould be cut through longitudinally at once.

Several are the advantages derived from this mode of operating. Firſt, no danger can then ariſe from the want of anatomical knowledge. Secondly, the covering being here very ſuperficial, little blood will be loſt, and the little that does eſcape, cannot get into the windpipe. Thirdly, the curved pipe can be very well ſecured, in order to carry on inflation and collapſe. Fourthly, if our attempts to recover be ſucceſsful, keeping the head naturally erect, will be the beſt poſition to approximate the divided cartilage; and laſtly, that the recurrent nerves are in no danger of being divided. The only inconvenience to be dreaded from this manner of operating, is that of committing an injury on the ſacculi laryngis, and thus to incommode the voice; but theſe are ſecured from danger, by cutting through the middle of the cartilage; and an union will be as completely effected, as if the trachea itſelf had alone been divided.

The ſurgeon ſtanding at the right ſide of the patient, ſhould perform the operation by putting the integuments on the ſtretch with the thumb and forefinger of the left hand, a longitudinal inciſion is then to be made immediately over the thyroid cartilage, into which may be inſerted the curved pipe that was intended to be introduced into the trachea by the mouth.

Whether this operation has, or has not been performed is of little conſequence to the recovery, if an inſtrument be introduced into the windpipe, that is connected with the other apparatus.

To the curved pipe for the trachea is to be fixed one extremity of the flexible tube, (Fig. 2. A); and the other end (B.) be attached to the inſtrument, (Fig. 3. C.) which may be fixed to the nozzle of any pair of bellows.

Every thing being prepared for inflating the lungs, one aſſiſtant is to have the direction of the bellows, and to ſtand at the head of the patient, whilſt the other prevents any air from eſcaping at the noſtril and mouth; or from the aperture, if any has been made in the trachea.

The bellows are now to be employed, until the cheſt is elevated; and the Medical Aſſiſtant, having the electrical machine prepared, is to place one director between the fourth and fifth rib of the left ſide, and the other between the ſecond and third of the right; ſo that the electrometer may diſcharge the jar, and the ſhock be made to paſs from the apex of the left ſide of the heart to the baſis of the right.

When the electrical ſtroke has been once more repeated, the aſſiſtant, who has the care of the mouth and noſtrils, is now to remove his hands, and preſs ſtrongly upon the cheſt; the bellows are again to be immediately employed, and another ſhock being prepared, the heart is to be thus ſtimulated twice or thrice, and the lungs collapſed as before.

If the heart retains any irritability, the effect of this treatment muſt be evident; for the collapſe of the lungs being removed, the contractions of the heart are renewed, a free paſſage is opened for the blood, and air is admitted to give it the change. But as the actions of the heart may probably not be ſufficiently powerful to propel the blood completely through the lungs, it becomes neceſſary to have recourſe to the collapſe, in order to effect this. We therefore, after having inflated the lungs, and electrified the heart, preſs upon the thorax, in order to expel moſt of the air contained in the lungs; for ſuppoſing the lungs have received but one ounce of blood from the contraction of the heart, a certain degree of collapſe will get rid of half of this blood; but if the collapſe is increaſed, the quantity of blood that will be acted upon will alſo be greater. This appears therefore a matter of importance, for the greater the quantity of blood that is ſent from the right ſide of the heart to the left, if at the ſame time it has received the wonted change from the air, the greater undoubtedly is the probability of its exciting the left to action, than when only half the quantity is tranſmitted.

If *natural reſpiration* be imitated without ever attending to the *collapſe* of the lungs, there can be little probability of ſucceſs, even ſhould the heart be electrified during the expanſion of the lungs. For if the pulmonary veſſels are diſtended with blood by the action of the right ſide of the heart, without producing a collapſe of the lungs, ſufficient to enable them to act mechanically in emptying theſe veſſels; there will ariſe nearly as great obſtruction to the action of the heart as when the collapſe exiſted; for the pulmonary veſſels muſt then be emptied as well as diſtended by the action of the right ſide of the heart alone, which by this diſeaſe is ſoon rendered ſo enfeebled, as to be wholly inadequate to ſuch an exertion.

By exhauſting the lungs, after the heart has been made to act during inſpiration, the *collapſe* will in ſome meaſure ſupply the abſence of powerful action in the right ſide of the heart; for all the blood the lungs have received is by that means carried to the left, by which we not only gain the advantage of ſending blood which has received its due heat from the air into the left auricle and ventricle, but moreover the pulmonary veſſels are again put in a fit ſtate to receive more blood from the action of the right, and even a feeble contraction of the heart will be capable of ſending blood into the pulmonary arteries, though a more powerful one would be inſufficient to propel it into the pulmonary veins and left auricle.

Mr. Field, a very ingenious mathematical inſtrument-maker in Cornhill, has invented an inſtrument (fig. 4.) which may be fixed to the nozzle of a common pair of bellows for the double purpoſe of inflating and collapſing the lungs. (For a deſcription of which ſee the explanation of the plate.) But in order to produce this effect, it is neceſſary that the valve hole of the bellows be cloſed by the inſtrument (Fig. 5.) by which means all the air employed muſt paſs through the ſmall aperture (d in fig. 4.) Hence the operation of inflating and collapſing the lungs neceſſarily becomes a ſlow and tedious proceſs, and which may be conſidered as an imperfection in this inſtrument, particularly if the bellows to which it may happen to be fixed be not air-tight, in which caſe the external air will find a ready entrance, and its intention as an air-pump will be defeated.

If dephlogiſticated air were at hand, there can be no doubt but that it would be far preferable to any other for inflating the lungs; but to procure it in ſufficient quantities at ſo critical a period is nearly impracticable, we muſt therefore make uſe of atmoſpheric air as pure as can be obtained.

If the jar be not charged to give the electrical ſhock, as ſoon as the lungs are expanded, no miſchief or inconvenience enſues; for we need only ſuffer a ſmall quantity of air to eſcape at the mouth after every inſpiration, and immediately throw freſh in by the bellows; and this proceſs is to be continued for about a minute; when, if the ſhock is not yet ready, we let go the mouth, and empty the lungs. The heart from this may have been irritated by the repeated inſpirations, while the lungs have not been ſuffered to obſtruct the free paſſage of the blood, and a freſh ſupply of air has been introduced to give it the neceſſary change; ſo that if the heart has acted during this period, collapſing the lungs will now convey the blood they have received into the trunks of the pulmonary veins and left auricle. This proceſs is therefore to be purſued where any circumſtance prevents the ſhock of electricity being given as ſoon as the lungs are expanded, or where no electrical machine can be procured; but as the irritability of the heart cannot long be excited to action by the mere diſtention of the lungs, we think it of the higheſt importance that electricity ſhould be employed.

It ſhould however be remembered that every ſhock given to the heart during the collapſed ſtate of the lungs, tends to rob it of its vital power, without promoting in the leaſt the recovery; and let it alſo be repeated, that the lungs from the beginning are never to be ſuffered to remain collapſed for a ſingle minute; as the heart may act at that very inſtant, and in this caſe without effect; for as every contraction is an expenſive operation to the heart, if it has got rid of no portion of its burden, the utmoſt care ſhould be taken that the lungs be expanded at every ſyſtole of the heart; and this can rarely happen from the uſual method of inflating the lungs without at the ſame time ſtimulating the heart. When the heart has been once emptied, occaſional ſhocks may be tranſmitted through other parts of the body (care always being taken that the heart partake of their influence, and that the lungs be expanded); for ſtimulating the extremities, may probably produce an action in the arterial ſyſtem; but it ſhould be ever in our eye that the heart is to be conſidered as the origin of circulation, and whilſt other parts of the body are electrified, care ſhould be taken that the heart at the ſame time, partakes of the ſtimulus.

In order to compare the difference of the effects produced by electricity on the heart, when the lungs are collapſed, and thoſe that reſult from it, when the lungs are in a ſtate of expanſion, the following experiment was made.

EXPERIMENT.

A Cat was ſtrangled, and five minutes after the laſt expiration the cheſt was opened; the lungs were then alternately expanded and collapſed for five minutes, the heart acted rather powerfully, but no alteration could be obſerved in the blood of its two ſides; either as to quantity or quality.

The heart was now electrified by ſmall ſhocks, during the exiſtence of collapſe, and this was continued for five minutes, when upon examination, it was obſerved that its action was evidently leſſened; the left ſide rather more diſtended than before, but the blood was black in both auricles and ventricles.

The lungs were now expanded, and the heart at this inſtant electrified; after two ſhocks had been given, they were collapſed; again expanded and electrified; and this proceſs was likewiſe continued five minutes. On examining the heart, both ſides were now found leſs diſtended, their action quickened, and the blood in the pulmonary veins, left auricle and ventricle completely florid.

The reſult of this experiment, not only proves the advantages of the ſtimulating power of electricity on the heart, beyond that of *ſimple inflation*; but alſo evinces the ſuperiority of adminiſtering it in the diſtended, over the collapſed ſtate of the lungs.

Whatever will excite the heart to expel its black blood, and ſupply the left ſide, and the whole arterial ſyſtem with blood, that has imbibed its natural heat from the air, muſt be the means of cure, the moſt efficacious that can be employed; and this laſt experiment ſeems to confirm the opinion, that electrifying the heart during the expanſion of the lungs, and then collapſing them, is the method the beſt calculated to produce this deſired effect.

With reſpect to the electrical machine the more compact, and at the ſame time the more powerful it is, the better; for as the quantity, neceſſary to be applied, muſt be determined by the jar and electrometer, the more ſpeedily it can be filled, the better. The ſize of the jar neceſſary for the purpoſe, ſhould be about thirty inches of coated ſurface; and the electrometer placed a little more than one third of an inch from the jar, the diſtance of which may be gradually increaſed. It is better that the glaſs of the jar be thin, as the ſhock will then be pungent, for if the glaſs is thick, the ſtroke will be large and denſe; and it appears probable, that the pungent ſtimulus would excite greater action in the heart than one that is denſe, without being ſo liable to deſtroy its powers.

All that appears neceſſary in theſe caſes, for the purpoſe of applying electricity is the cylinder, a conductor, jar, electrometer; wire and directors, in order to convey the ſhock to the particular parts we wiſh; and all theſe may be compriſed in a box of twenty inches in length, and twelve in width; and as every medical man may have occaſion to make uſe of electricity for other purpoſes, the expence will not be thrown away, even ſhould he never meet with this moſt ſatisfactory employ of it, the attempting or perhaps the actual reſtoring of the apparently dead to life.

There appears no neceſſity for making uſe of the inſtrument invented by Dr. Goodwyn, for the purpoſe of extracting water from the lungs, as thoſe who have recovered from drowning, muſt all have taken in water, without its having produced any remarkable inconvenience; and as the extracting it would take up a conſiderable time, we think it better as ſoon as poſſible to proceed to the diſtention of the lungs.

We ſhall now inquire into the effects produced by the application of warmth.

SECTION X.

Effects of Warmth.

IT has been the uniform opinion of thoſe who have turned their attention and their pens to the ſubject of ſuſpended reſpiration, from drowning, hanging, and ſuffocation; that the application of heat is abſolutely neceſſary, and that it ought to be made with the moſt gradual, and nearly inſenſible increaſes. This idea ſeems to have been ſuggeſted, by attending to the good effects of warmth on torpid animals, and the manner that nature preſcribed, was that of its being applied in the moſt gradual manner; for where the body has been frozen, a ſudden application of heat has been found deſtructive, whereas a leſs degree has proved beneficial.

It would be preſumptuous to deny that theſe obſervations and precautions ſeemed well grounded. But it muſt however be confeſſed, that the detection of any ſtrict ſimilitude between the two diſeaſes, would be attended with no ſmall difficulty. In the one, the vital principle is attacked merely by a ſedative power, in the other, it is endangered by a collapſe of the lungs, which not only prevents the free paſſage of the blood, but at the ſame time deprives it of that due degree of heat, which it borrows from the air.

Dr. Goodwyn has particularly inſiſted on this gradual application of warmth, but his plan of treatment does not coincide with our opinion. He obſerves, " that to fa-

" vour the recovery moſt effectually, the " application of heat ſhould be conducted " on the ſame plan nature has pointed out " for torpid animals. It ſhould be applied " very gradually and uniformly, and it " may be raiſed to 98, but not further " than 100. When the body is warmed " uniformly, and the heat of the interior " parts about 98, we direct our attention " to the ſtate of the thorax, and if the " patient make no attempt to inſpire, we " proceed to inflate the lungs." Nor does this practice appear to be altogether in uniſon with the Doctor's own theory on the nature of the diſeaſe, for external warmth can produce no chymical change on the blood; and as he aſſerts that the heart cannot act until a change has been produced, what great expectations can we form of its being attended with ſucceſs. Moreover, this gradual application of heat muſt engroſs no inconſiderable portion of time, already too precious, before the external heat can be much increaſed, and the action alſo of the muſcles of reſpiration could rarely be reſtored before that of the heart.

We alſo are obliged to with-hold our aſſent from Dr. Goodwyn's opinion, where he ſays, that whilſt the circulation of the blood continues, the temperature of the body may be raiſed many degrees above the natural ſtandard without inconvenience. To this aſſertion is oppoſed the reſult of Dr. Fordyce's experiments, which prove that upwards of two hundred degrees of external heat of Fahrenheit's ſcale could not raiſe the animal heat three degrees; and it may be a doubt, whether *internal* animal warmth can ever be raiſed to 98 or 100 by the application of external heat, in caſes where *life is preſent*, but where circulation and reſpiration are ſuſpended. The warmth of the body in health may be decreaſed many degrees without much inconvenience; but never can be raiſed more than three or four above the natural ſtandard, without producing pernicious effects; which, to guard us againſt, nature has prudently provided two powers of reſiſting heat, while ſhe has given us only one of generating it. We however perfectly agree with Dr. Goodwyn, that warmth is eſſential, and that in its application it ſhould neither be ſuddenly nor irregularly increaſed; but we can on no account deem it allowable, to wait for any *increaſe* of heat in the interior parts, before the lungs are inflated, as it ſeems impracticable to increaſe the *internal* heat, before this end is firſt accompliſhed, unleſs irritability be abſolutely deſtroyed.

To regulate the application of this remedy, it does not appear neceſſary to aſcertain the degree of heat on the external ſurface of the body, and of the rectum, ſince we can always judge of the warmth of the atmoſphere within five or ſix degrees, and as water whilſt in a fluid ſtate muſt have its temperature nearly equal, we only have to be cautious that the warmth of the room be not at firſt much greater. But as it may be ſome ſatisfaction to the Surgeon to know the degree of heat remaining in the body, (ſince the greater the degree of heat, the greater muſt be the irritability;) it may not be improper or unſatisfactory to be furniſhed with a thermometer, and Mr. Hunter's ſeems the only one that is any way adapted to the purpoſe; ſince aſcertaining the heat of any part of the body, except in canals, cannot be of the ſmalleſt utility.

A Thermometer ſeems alſo neceſſary for regulating the increaſe of heat, ſince our ſenſations are more likely to deceive us afterwards than at firſt; and it is of importance that the warmth be not very conſiderable: perhaps 70 degrees of Fahrenheit's ſcale, is as much as ſhould ever be applied, ſince to ſupport any degree above this produces a waſte of ſtrength, which on the contrary we ſhould endeavour to obviate.

Warmth thus applied is certainly highly expedient, and its effects on the ſyſtem are probably theſe, that the blood in drowning, &c. deprived of the greater part of the latent heat it imbibes from the air, becomes inſufficient to ſtimulate the ſolids; but by the application of ſenſible heat to the ſurface of the body, the heat of the animal is prevented from being ſo ſoon carried off; and thus in ſome meaſure ſupplies the place of that latent heat which naturally is abſorbed by the blood; for although heat be abſorbed from the air in a latent form, it is given out to the ſyſtem in a ſenſible one. Let it not, however, be underſtood that warmth is to effect a cure of itſelf; for we have repeatedly mentioned that the collapſe of the lungs has cauſed an obſtruction to the paſſage of the blood; and before circulation can go on, this obſtruction muſt be removed, and the blood furniſhed with its uſual ſtimulus and change.

Various are the modes of applying heat to the body; warm bath, warm grains, &c. but theſe are means more eaſily directed than procured or put in execution; and there is only one advantage attending them, that of applying heat more univerſally. Even this is counterbalanced by a greater objection, as it prevents us from having recourſe to frictions, and permits ſuch a length of time to elapſe before either warm bath, or grains can be procured.

The more adviſeable method therefore may be, to place the patient on a mattreſs or bed at a proper diſtance from the fire, where every other operation, that is thought proper, can be carried on at the ſame time; and the readineſs with which warmth can be thus applied, muſt certainly be a convenience.

We propoſe next to enquire under what circumſtances frictions may be uſeful.

SECTION XI.

Effects of Frictions.

It is with great propriety Mr. Kite has limited the uſe of frictions; at the *commencement* of the curative operations they muſt be productive of infinite miſchief: for the right ſide of the heart being already overloaded with blood, we are by the uſe of frictions increaſing its quantity: and it ſcarce can be doubted but that this practice has contributed in many inſtances to fruſtrate the moſt ſucceſsful treatment, by producing an over diſtention, and conſequently indirect debility of the right ſide of the heart. With a view to aſcertain by experiment the effects of early frictions, the following one was made.

EXPERIMENT.

A Cat was ſtrangled; and after it had ceaſed to breathe, the body and extremities were thoroughly rubbed for ten minutes, the cheſt was then opened. On examining the heart, the right ſide was found *fully* diſtended, and the left rather more ſo than uſual, without any ſign of action in either.

An opening was then made in the inferior cava, ſo as to let out a portion of blood; and the action of the right ſide of the heart was ſoon renewed.

This experiment was repeated, and it invariably reſulted, that the more the right ſide of the heart was diſtended, the weaker was its action, and that by letting out a quantity of its blood, the action was reſtored; and where no action was evident, during the diſtention, it was generally renewed by removing part of the blood from the heart.

It is however with friction as with electricity; if made uſe of at one time, it may tend to deſtroy life, and at another it may greatly aſſiſt in the recovery.

In our ſurvey of the common effects of ſuſpended reſpiration, it was obſerved that the aorta and arterial ſyſtem contained a quantity of blood; this point being aſcertained, and it being likewiſe known, that the action of the aorta and arterial ſyſtem is ſuſpended from a decreaſe of the due ſtimulus in the blood, and that the veins have little or no contractile power of their own; when once the right ſide of the heart has been enabled to rid itſelf of a portion of its contents by the plan mentioned in the eighth ſection, we ſhould then proceed to frictions, as a ſubſtitute to the natural action of the arteries in health, viz. that of propelling the blood onward, and producing a *vis a tergo* on the blood in the veins. The right ſide of the heart being thus in part emptied, is again pretty rapidly distended by the application of frictions, which ſhould be continued as long as electricity is employed; but when from any cauſe we are prevented from electrifying, we ſhould be ſparing and cautious in the uſe of frictions, leſt by over diſtention we deſtroy the action of the heart. From frictions made uſe of as a ſtimulant, little or no advantage can be expected.

The excoriations produced by the application of ſalt, brandy, volatile alkali, &c. muſt be exceedingly troubleſome after recovery; this objection however ſhould have but little weight were any real advantage derived from their uſe; but the application of ſtimuli to the eyes, noiſes to the ear, acrid liquors to the tongue and palate, ſternutatories to the noſtrils, ſcarifications to the ſkin, and the actual cautery, are not only horrid in the very idea, but muſt undoubtedly contribute to extinguiſh the little that remains of animal life, rather than to rouze or re-eſtabliſh it into action; for their effect on the nervous ſyſtem muſt be ſimilar to that of electricity when applied to the heart during the collapſe of the lungs, viz. the deſtruction of irritability. The idea that ſuggeſted ſuch applications muſt have ariſen from ſuppoſing the animal powers to be only in a ſtate of torpor, without conſidering that there exiſted a cauſe, without the removal of which all theſe attempts muſt not only prove fruitleſs and abortive, but even deſtructive to life much ſooner, than if no remedy at all had been employed.

There appears to be an objection to the uſe of vitriolic acid with oil, or any application that produces an unknown and partial degree of heat. It may be preferable as a medium for friction, to make uſe of a little common oil or lard, which will rather prevent than occaſion excoriations, at the ſame time that it anſwers every other purpoſe and intention; for the principal end to be obtained by frictions is by means of their mechanical action, and any medium that will facilitate this, appears preferable to thoſe applications which ſtimulate and generate heat, for as much warmth as is deemed requiſite may be applied to the body by more certain and leſs diſagreeable means. Nor ſhould it be forgotten that the circulation even in health, is moſt languid at the remote parts of the body; conſequently the frictions ſhould be chiefly applied to the upper and lower extremities, and the body ſhould be occaſionally rubbed, where it does not interfere with the electric ſhock.

We ſhall next examine into the effects of Enemas.

SECTION XII.

Effects of Enemas.

AS tobacco thrown up the rectum in the form of ſmoke was one of the firſt remedies employed in ſuſpended reſpiration, and as we ſee, to our great regret, that it is ſtill too frequently made uſe of, we ſhall endeavour, by a few animadverſions on its effects, to proſcribe its continuance.

Mr. Kite, I believe was the firſt who reprobated the uſe of tobacco; and the arguments he adduces in ſupport of his opinion are truly ingenious.

The hiſtory of medical errors, ſcarce affords an inſtance of a more blind and obſtinate prejudice, than that which ſtill induces us to adopt a mode of practice ſo obviouſly deſtructive. It is actually exhibiting a poiſon, that acts as moſt other vegetable poiſons do, by producing ſuch an extreme degree of debility as no powers of life can ſupport; and there can be ſcarce any raſhneſs in affirming that ſuch quantities of tobacco have been adminiſtered in this diſeaſe in the form of ſmoke, as would have exhauſted the vigour of a healthy horſe. And indeed can there be any thing more evidently improper than ſuch a practice? We might with as much propriety recommend tobacco in ſyncope, or in a typhus fever, as in ſuſpended reſpiration from drowning, &c. nor can there be the leaſt doubt entertained of the effects it would produce in either of theſe diſeaſes.

When we conſider the effect that a drachm of tobacco in infuſion has upon the ſyſtem, when given ſolely to produce a temporary debility in hernia, &c. one would ſcarcely credit that any perſon acquainted with this effect, could even think of adminiſtering eight or perhaps twelve times this quantity, when the powers of life are reduced to their loweſt ebb. It is really an indelible ſtigma on the profeſſion, that while we cannot but obſerve the deleterious tendency, even of a ſmall quantity of it, on one diſeaſe where we wiſh to reduce the ſtrength; we nevertheleſs employ it by wholeſale in another, where ſcarce a ſpark of life remains unextinguiſhed; with headſtrong inattention we have perſevered in its uſe, without ever aſking ourſelves this neceſſary queſtion—What are we rationally to expect from ſuch a remedy? This, indeed, is quackery in the higheſt degree.

When examining the effects of medicines thrown into the ſtomach after reſpiration had ceaſed, it was found that their action was far leſs powerful than when adminiſtered in full health; and it is a fortunate circumſtance indeed, that their operations are regulated by ſuch a law; for if medicines produced the ſame effect in this diſeaſe as during the unimpaired vigour of the natural functions, it may without heſitation be declared, that no one could ever have been recovered where tobacco had been employed in quantities equal to what has been recommended. Tobacco injected into the ſtomach will of courſe produce more violent effects than when thrown up the rectum; but when the quantity employed is perhaps equal to two ounces, the effects muſt be as violent, if not more ſo, than a ſixteenth part injected into the ſtomach.

In order more accurately to determine the effects of tobacco enemas, the following experiment was made.

EXPERIMENT.

A full grown cat was drowned, and the cheſt being immediately opened, the heart was obſerved to act ſtrongly; ſix drachms of tobacco were thrown up the rectum in the form of ſmoke, but before the herb was half conſumed, there remained ſcarcely any action in the heart; and after the whole had been injected, all action ceaſed to be viſible, (without applying the ſtimulus of electricity.) Mr. Kite has ſubſtituted in the place of tobacco, ſome aromatic herb; if we are to make uſe of gliſters at all, this were certainly preferable, but what great advantages are to be expected from them, is no eaſy matter to diſcover.

If the diſeaſe is not removed by the means before laid down, we may with as much confidence expect a recovery from injecting a little warm milk and water into the ſtomach, as from the injection of enemas of any kind.

It ſhould alſo be remembered that enemas ought to be ſmall in bulk, in order to render them innoxious; for ſmoke and fluids of all kinds, when given in large quantities, will diſtend the inteſtines; the reſult of which will be, that their mechanical effect in preventing the eaſy deſcent of the diaphragm, will neceſſarily be productive of miſchief. Warm enemas may have the ſalutary effect of ſlightly ſtimulating the inteſtines; and the heart alſo from ſympathy, may poſſibly have its action in ſome ſmall degree increaſed, but if tobacco be employed, the oppoſite effect muſt ariſe, and as ſympathy is ſuppoſed to be greater between the heart and ſtomach, than between the heart and inteſtines, it were better to inject ſome warm aromatic, into that viſcus, than into the rectum; but inflation, electricity and frictions, ought by no means to be neglected to make room for ſo ineffectual a remedy.

Having examined the merits of the remedies uſually employed in ſuſpended reſpiration, and recommended ſuch as are countenanced by enquiry and experience, it may not be deemed unneceſſary to ſubjoin an account of the method of conducting the treatment.

SECTION XIII.

Method of Cure.

THE plan of treatment generally to be purſued has been laid down ſomewhat at large in ſeparate ſections, but it may not be unſatisfactory to the practitioner, in theſe caſes, to ſee the whole contracted into an abridged form, and placed in a nearer and cloſer point of view.

As a few minutes in this diſeaſe make a material difference as to the probability of recovery, we think it of ſufficient importance to remark, that the electrical machine and the apparatus for artificial reſpiration, ſhould be kept always at hand, and in readineſs.

As ſoon as we have ſeen the body, we ſhould requeſt that no more ſpectators would be preſent than are abſolutely neceſſary; which we conceive may be eight or nine in all, including the Medical Aſſiſtants; two to have the direction of the cheſt, one to turn the electrical machine, one to direct the ſhock, four to apply the frictions, and the other to aſſiſt occaſionally. This number will be ſufficient for anſwering every purpoſe, and a greater would rather embarraſs, and only contribute to phlogiſticate and render the air leſs fit for reſpiration.

The body, if wet, ſhould be gently dried with cloths, but in ſuch a cautious manner, as to prevent the mechanical effect of the friction from propelling the blood towards the heart.

Having prepared the bed, or mattraſs, on a table of convenient height, the body is to be placed on it with the head a little elevated. Five or ſix ounces of brandy, rum, or ſome other warm aromatic ſhould be thrown into the ſtomach, by means of the vegetable bottle and pipe; and the ivory director paſſed to the farther part of the mouth, ſo as to cloſe the ſuperior aperture of the œſophagus.

If the patient ſeems plethoric, and more particularly if the diſeaſe has been occaſioned by hanging; bleeding ſhould be employed, and that as one of the firſt remedies; nor ſhould the application of a proper degree of warmth be neglected.

The curved pipe being then introduced into the trachea, and ſecured by an aſſiſtant, and the flexible tube, &c. being attached, the lungs ought as ſoon as poſſible to be inflated; and the electrical machine being prepared, one director is to be applied between the fourth and fifth rib of the left ſide, and the other between the ſecond and third of the right; when the electrometer is to be placed a little more than one third of an inch from the jar, and the ſtroke given. The electrical ſhock is to be repeated once or twice, and the aſſiſtant, who prevented the air from eſcaping by the noſtrils and mouth, then ſhould remove his hands, and preſs the cheſt, and immediately after expand the lungs, for the heart to be again ſtimulated.

If any impediment ſhould prevent the introduction of the pipe down the trachea, bronchotomy ſhould be directly performed, in the manner deſcribed in Section the ninth, and the curved pipe inſerted into the trachea at this aperture.

When the lungs have been three or four times expanded and collapſed, frictions are to be had recourſe to; theſe, together with the proceſs of expanding the lungs, and at the ſame time electrifying the heart, and then again collapſing them, are to be continued four hours without intermiſſion, unleſs natural reſpiration be reſtored.

In ſome caſes where the living powers are remarkably languid, it may be adviſeable to continue the uſe of electricity, and gentle frictions, even after reſpiration is renewed, as there have been inſtances of momentary and tranſient recoveries: the ill ſucceſs of which may be conceived to ariſe either from the heart not poſſeſſing ſufficient irritability to carry on the circulation, or from want of a ſupply of blood to the right ſide of the heart after it has been once emptied. Both theſe obſtacles may be removed by aſſiſting the heart and arteries to perform their reſpective functions, after the muſcles of reſpiration have been ſtimulated to action.

If unfortunately no electrical machine be in readineſs, or at hand, the method of performing artificial reſpiration ſhould be altered. When the lungs are expanded, the aſſiſtant, who has the charge of the mouth and noſtrils, ſuffers a ſmall quantity of air to eſcape, while the other aſſiſtant continues to throw in a freſh ſupply: this proceſs ſhould be protracted for about a minute, when the hand is to be removed from the mouth, and the cheſt preſſed, to complete the collapſe. It cannot be too frequently inculcated, that the lungs are never to be ſuffered to *remain* collapſed; for all our endeavours and attempts to effect a recovery, ſhould the lungs be permitted to continue in that ſtate, muſt ultimately prove fruitleſs and ineffectual.

We cannot better conclude the preſent diſſertation, than by briefly recapitulating the principles and obſervations which form its baſis and ſupport.

CONCLUSION.

FROM what has been obſerved it appears,

1. That during the act of drowning the animal emits air from its lungs, and in its attempt to inſpire, a ſmall quantity of water enters the lungs and ſtomach.

2. That, after the laſt expiration, the lungs are found nearly collapſed, containing a ſmall quantity of froth, but very little air.

3. That the quantity of blood found in the right ſide, is nearly double that contained in the left.

4. That the blood contained in both ſides of the heart is of the colour of venous blood.

5. That, whether the heart be examined during its contractions, or after they have ceaſed, no perceptible difference is found in the proportions.

6. That the action of the heart ſurvives the periſtaltic motion of the bowels.

7. That the veſſels of the head exhibit no extravaſation, nor even diſtention.

8. That where reſpiration is ſuſpended, from ordinary hanging, the animal has the power of expelling air from its lungs.

9. That although the muſcles of expiration perform their office, no power can be applied to open the trachea to admit air.

10. That as no air can be received, the animal dies with the ſame collapſe of the lungs from hanging as from drowning.

11. That the quantity of blood in the two ſides of the heart bears nearly the ſame proportion in hanging as in drowning.

12. That there is very little difference in the continuance of the irritability of animals after hanging from its continuance after drowning; but the veſſels of the head are ſomewhat diſtended in the former.

13. That animals immerſed in impure air do not appear to make a full inſpira-

tion, but like animals immerſed in water reject it, as ſoon as a ſenſation is produced in the trachea, which ſeems to make them conſcious of not being in their uſual element.

14. That the muſcles of expiration continue to act till they have expelled all the air from the lungs, which they have the power of acting on.

15. That the ſame collapſe of the lungs is produced from ſuffocation, as from drowning or hanging; and the contents of the right ſide of the heart bear nearly the ſame proportion to thoſe of the left.

16. That animals deſtroyed in impure air are ſooner deprived of their irritability than when reſpiration is ſuſpended from drowning or hanging.

17. That animals deſtroyed by nitrous air ſoon grow ſtiff and inflexible, ſometimes even before the heart has ceaſed to vibrate.

18. That the veſſels of the head contain leſs blood after ſuffocation from impure air, than after hanging.

19. That in *ordinary* reſpiration and circulation, the lungs are paſſive.

20. That the principal advantage derived from reſpiration, is that of its being the ſource of animal heat; and this heat, by being evolved in a ſenſible form, keeps up the irritability of the whole animal.

21. That the blood imbibes leſs or more latent heat, in proportion to the degree of ſenſible warmth applied to the ſurface of the body.

22. That although the temperature of the florid blood in the left ſide of the heart be at firſt lower than that of the right; yet its ſenſible heat ſoon becomes greateſt.

23. That this circumſtance favours the idea of heat being abſorbed from the air in the act of reſpiration.

24. That as ſoon as the blood has undergone the change in the lungs, it is rendered fit to ſupport the heat and irritability of the animal.

25. That heat is not only evolved from the blood as it paſſes through the capillaries, but that the ſame proceſs continues throughout the whole circulation.

26. That the ſtimulus which excites the heart to act, is the ſame in all its cavities; and this principally is diſtention.

27. That in the fœtus both ſides of the heart act from the ſtimulus of black blood.

28. That the intent of the fœtal and adult change is the ſame, viz. that of ſupporting animal heat and irritability.

29. That this change is effected in the fœtus, by the blood paſſing through the cells of the placenta, and the veſſels coming in contract with the maternal arterial blood.

30. That ſo much phlogiſton * is imparted to the maternal from the fœtal blood, and *only* ſo much latent heat

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* It ſhould have been remarked before, that, whether the doctrine of phlogiſton be eſtabliſhed or not, the theory of animal heat being derived from reſpiration, may ſtill be ſupported, as every phenomenon reſpecting this doctrine can be equally well explained without employing the term phlogiſton.

evolved from the maternal to the fœtal, as is neceſſary to reſtore the equilibrium of heat and phlogiſton.

31. That as the fœtus is ſurrounded by the warm medium of the liquor amnii and mother, very little heat can be conſumed, and therefore an abſorption of heat equal to that of the adult is not neceſſary.

32. That the fœtus only poſſeſſes one power of reſiſting heat, and as the heat to be imbibed by the fœtal blood is always limited, and as it is always ſurrounded by an uniform degree of temperature, the fœtus ſtands in no need of the power of reſiſting heat, or generating cold by evaporation.

33. That the fœtal heart contains only a ſmall portion of blood that has been to the

placenta; and as this blood can receive only a partial change, and as even the greater part of that ſame blood muſt firſt paſs through the capillaries before it arrives at the left auricle and ventricle; morever, as that which does not paſs through capillaries mixes with venous blood, it follows that the left ſide of the fœtal heart contracts from the ſtimulus of black blood.

34. That as all the blood which paſſes through the lungs muſt enter the left auricle, the latent heat of the fœtal blood in the right ſide muſt exceed that of the left.

35. That the blood in the umbilical arteries which is to receive the change, being of the ſame quality with that in the left ſide of the heart, is an additional proof that this blood muſt be black.

36. That although the blood in the fœtal heart and arteries be black, yet, like the blood of the adult in the right ſide of the heart and pulmonary artery, it muſt ſtill poſſeſs a portion of latent heat, which it continues to evolve, in order to keep up the temperature and irritability of the whole animal.

37. That in ſuſpended reſpiration from drowning, &c. the right ſide of the heart continues to act after the left has ceaſed.

38. That the reaſon of this difference is not that the left ſide of the heart is incapable of being ſtimulated by black blood; but from this blood being eſſentially different in quality from that of the right.

39. That this difference of quality in the blood of the left ſide of the heart

depends on its having paſſed through the lungs, and imparted to them a conſiderable portion of its heat, without receiving a ſupply from reſpiration; while the blood of the right poſſeſſes a quantity of heat in a latent form, which it ſtill continues to evolve.

40. That as the blood in the right ſide of the heart, contains a portion of latent heat, while that of the left is exhauſted; and as the ſenſible heat both of the right auricle and venticle muſt conſequently predominate, its irritability of courſe will likewiſe be greater.

41. That the ſtimulus of diſtention being greater in the one than in the other, will tend to produce a difference of action.

42. That as the right ſide of the heart poſſeſſes more irritability in this diſeaſe than the left; and as the ſtimulus of diſtention is alſo more powerful at the right ſide than at the left, it will be capable of continuing its action when no effect is produced on the other.

43. That although the heart may derive its heat in health, principally from the blood in the coronary veſſels; yet the blood in the cavities of the heart will be alſo capable of evolving heat, and more eſpecially when ſtagnation takes place in ſuſpended reſpiration.

44. That if the right ſide of the heart poſſeſſed the blood of the left; and the left the blood of the right, the degree of irritability muſt be reverſed.

45. That if the right ſide of the heart in ſuſpended reſpiration, had the irritability of the left, and the left the irritability of the right, we ſhould ſcarcely be able ever to effect a recovery.

46. That as ſoon as the action of the left ſide of the heart is increaſed by the ſtimulus of florid blood, the right alſo acts more powerfully.

47. That this depends on the coronary veſſels being ſupplied with blood, that has received a quantity of heat from the air, and which theſe veſſels diſtribute alike to the right, and the left ſide, and conſequently give an equal increaſe to the irritability of both.

48. That the heat and irritability of the heart, being then the ſame, the ſtimulus

of diſtention will produce an equal action.

49. That the heart can be made to act after reſpiration has ceaſed, from the ſtimulus of electricity, while no action can be excited in the external parts from the ſame cauſe.

50. That as electricity is capable of producing action in the heart, when it has no effect on the exterior parts, and as life actually exiſts at this period. It would lead to moſt pernicious conſequences to conclude that life was totally extinct, from no external action being produced by electricity.

51. That as the difference of irritability in animals of the ſame order, depends

more on the ſpecific ſtate of the ſolids, than on the quantity of heat evolved from the fluids, no deciſive prognoſtic can be drawn of the preſence of irritability, from the heat of the animal being above that of the atmoſphere.

52. That as electricity has been found incapable of producing external action, when the heat of the animal was much above the temperature of the ſurrounding medium, it proves that animal heat and evident irritability are by no means coequal.

53. That although heat and irritability are not coequal, yet the greater the degree of heat, the more will be the irritability of any particular animal.

54. That as the heart is conſidered as the origin of circulation, there is a probability

bility of recovery, ſo long as the heart can be made to act; although external irritability may not be manifeſted by the teſt of electricity.

55. That it will ever be better to have no criterion to judge of the abſence of life, and make uſe of every means of recovery, in every inſtance, than to rely on an imperfect and hazardous prognoſtic.

56. That when the lungs are inflated ſoon after the laſt expiration, both ſides of the heart will immediately act.

57. That this probably proceeds from the irritability of the heart being ſtill ſo great as to be ſtimulated to action by the mechanical irritation of the lungs, as in proportion to their expanſion, will their ſurface preſs upon the two ſides of the heart.

58. That in ſuſpended reſpiration, from drowning, hanging, and ſuffocation, as the collapſe of the lungs begins, the impediment to the paſſage of the blood through them commences.

59. That when the laſt expiration is made, the interior pulmonary veſſels are collapſed, and contain but a ſmall quantity of blood.

60. That if even a change be produced on the quality of this blood, the quantity is ſo ſmall, that unleſs the right ſide of the heart be firſt excited to action, the motion of the lungs alone will be unable to propel this blood into the left.

61. That by inflating the lungs, we cannot alter the quality of the blood in the

trunks of the pulmonary veins and left auricle.

62. That the right ſide of the heart can propel blood to the left, immediately after the laſt expiration, independant of the mechanical action of the lungs.

63. That as the heart can perform this function after reſpiration has ceaſed, it appears that the lungs have naturally no active power of propelling the blood onward.

64. That part of the black blood contained in the left auricle and ventricle in this diſeaſe, muſt be propelled through the ſyſtem unaltered, whenever a recovery is effected, and as a quantity of blood of the ſame quality has already paſſed into the arterial ſyſtem, it evidently follows that the

left auricle can and does act from the ſtimulus of black blood.

65. That as an animal when immerſed in warm water, may be drowned with its blood ſomewhat florid, it neceſſarily furniſhes an objection to the opinion, that the action of the left heart ceaſes from the preſence of black blood.

66. That as in drowning, &c. the impetus of blood to the head is checked immediately after the obſtruction to its return takes place, no injury whatever can happen to the brain.

67. That if apoplexy did actually take place, we ſhould never be able to bring about recovery after reſpiration had once ceaſed, ſince we frequently fail of removing common apoplexy during the ex-

iſtence of reſpiration ; and in drowning, &c. we find no extravaſation. That as no extravaſation takes place in the head, if apoplexy were to exiſt, it ſhould be ſolely attributed to the diſtention of the veſſels.

68. That as mere diſtention is capable of bringing on only a very mild ſpecies of apoplexy, which does not for many hours, and ſometimes for many days, produce its fatal effect; and as on the contrary, apparent death from drowning, hanging, and ſuffocation, takes place in a few minutes; it certainly follows that this diſeaſe and apoplexy are as eſſentially different as any two diſeaſes to which the human body is expoſed.

69. That the immediate cauſe of the ſuſpenſion of circulation is not *the preſence of black blood in the left ſide of the heart*,

neither is it the *want of motion in the lungs*, but it ariſes from a *collapſe of the pulmonary veſſels, which produces a mechanical obſtruction to the paſſage of the blood.*

70. That the proximate cauſe of the diſeaſe may be ſaid to conſiſt in a collapſe of the lungs, producing a collapſe of the pulmonary veſſels, with want of latent heat in the blood, ſince unleſs both theſe be removed the diſeaſe will ſtill continue.

71. That the mechanical obſtruction from collapſe muſt firſt be removed, before the chymical effects can take place.

72. That emetics in this diſeaſe are improper, before the circulation is re-eſtabliſhed.

73. That even then they ſhould only be exhibited where the ſtomach is known to have been overloaded previous to the accident that produces the diſeaſe.

74. That all medicines introduced into the ſtomach, produce a leſs effect after reſpiration has ceaſed, than during the healthy actions of the animal; and that in this diſeaſe, all that appears neceſſary to be done is to inject of ſome warm cordial, ſuch as brandy, &c. into the ſtomach.

75. That as in ſuſpended reſpiration, from hanging, there will ſometimes be a plethora in the head, as well as in the right ſide of the heart, bleeding will then be more frequently neceſſary than after drowning and ſuffocation.

76. That the degree of plethora in the head will greatly depend on the weight and bulk of the ſubject.

77. That as in drowning and ſuffocation the right ſide of the heart only is in a ſtate of plethora, and as this cannot be relieved, this operation ſhould never be performed unleſs it appears that there is too much blood in the ſyſtem for the ſolids to act upon.

78. That when bleeding is judged requiſite, it ſhould be performed on the jugular veins in preference to any other.

79. That when bleeding is deemed expedient, it ſhould be one of the firſt remedies employed.

80. That ſhocks of electricity paſſed through the heart, brain, and ſpinal marrow, without the collapſe of the lungs being at the ſame time removed, muſt tend rather to deſtroy than reſtore the principle of life.

81. That imitating natural reſpiration without frequently producing a collapſe of the lungs is of little avail; for the diſtention of the pulmonary veſſels occaſioned by the action of the right ſide of the heart, will form nearly as great an obſtruction to the paſſage of the blood, as if the collapſe continued to exiſt.

82. That the uncertainty of ſucceſs which has hitherto attended the caſes reported by the Humane Society, has probably been in a great meaſure occaſioned by the method that was adopted of conducting the artificial reſpiration.

83. That the advantages to be derived from artificial reſpiration, are to procure a contraction of the right ſide of the heart when the lungs are dilated, and by collapſe to excite the left auricle to get rid of a portion of its contents, and ſupply it with blood that has renewed its ſtimulus from the air.

84. That in order thoroughly to accompliſh this end, we are to expand the lungs, and when expanded, to ſtimulate the heart by a ſmall ſhock of electricity; we are then to collapſe them, and again to inflate.

85. That from this mode of proceeding, if any irritability remain in the heart, the right auricle and ventricle will be ſtimulated to act, and propel ſome of its blood into the lungs, where it meets with

a free paſſage, and air to impart to it its due ſtimulus and heat; the blood thus duly changed, will, by means of the collapſe, excite the left to get rid of its burden, and furniſh it with a freſh ſupply endued with the proper ſtimulus.

86. That if no electrical apparatus be in readineſs, we ſhould then alter our method of artificial reſpiration.

87. That the lungs ſhould be diſtended, and after allowing a ſmall quantity of air to eſcape, the inſpiration ſhould be repeated; and this proceſs of ſuffering, after each inflation, a little air to eſcape, (or, in other words, imitating natural reſpiration) ſhould be continued about a minute, when we are to exhauſt the lungs; ſo that there ſhould be but one complete expiration here to ſeveral inſpirations.

88. That the intention of this practice is, that as the heart may poſſibly not contract more than twice or thrice in a minute, the blood may find a free paſſage whenever it happens to act, and a freſh ſupply of air to produce on it the neceſſary change; and likewiſe that theſe ſeveral inſpirations may act as ſtimuli to the heart, while the collapſe helps to remove the blood the lungs have received.

89. That during the whole proceſs of the treatment the lungs ſhould never be ſuffered to remain in a collapſed ſtate for a ſingle minute.

90. That electricity ſhould never be employed on any account without a concomitant expanſion of the lungs.

91. That if the heart be excited to act during the collapſe of the lungs, very little more blood can paſs through them than paſſes in the fœtal circulation, and even this ſmall portion receives no benefit from the air.

92. That the application of warmth is neceſſary, and that when firſt applied ſhould be about ſix degrees above that of the open atmoſphere, if this be below 70 of Fahrenheit.

93. That we are on no account to wait for any increaſe of heat, before we inflate the lungs.

94. That placing the body on a mattraſs or bed at a proper diſtance from the fire, is the beſt mode of applying

warmth;

warmth; as it neither embarraſſes nor prevents any other proceſs that may be found expedient.

95. That the principal advantage to be expected from the application of warmth, is to prevent ſo much ſenſible heat being evolved from the blood, and which thus in ſome meaſure may ſupply the defect of the latent heat that ſhould have been abſorbed from the air.

96. That frictions made uſe of as a primary remedy are highly improper, as they tend to deſtroy the action of the heart, by promoting an over diſtention.

97. That frictions ſhould never be employed before the lungs have been ſeveral times expanded and collapſed.

98. That after the heart has been in part emptied, frictions are abſolutely neceſſary.

99. That a little common oil or lard, as a medium for the frictions, is preferable to either ſalt or ſpirits, or any other ſtimulating ſubſtance.

100. That the principal effect to be expected from frictions, is their mechanical action in propelling blood towards the right ſide of the heart.

101. That tobacco in any form is highly pernicious, and were this medicine to produce ſuch baneful effects in caſes where reſpiration is ſuſpended, as in a ſtate of health; it is more than probable that no one could ever have been recovered where this remedy had been applied.

102. That enemas of any kind are only to be conſidered ſerviceable, in as much as they co-operate with more important remedies; and if employed at all, warm ſtimulating ones ſhould be preferred.

103. That their bulk ſhould be ſmall, leſt by their mechanical action they prevent the free deſcent of the diaphragm.

104. That inflating the lungs, electrifying the heart, collapſing the lungs, and the application of frictions, are to be continued four hours, if our endeavours be not previouſly crowned with ſucceſs.

105. That electricity and frictions are to be continued even after reſpiration is reſtored, if the powers of life ſeem unequal to the taſk.

106. That the final intention of the whole plan of treatment, *is to imitate the natural circulation.*

DESCRIPTION OF THE PLATE.

FIG. I.

A large ſilver conical pipe to be introduced into the trachea, either by the mouth, or by an opening made in the thyroid cartilage. A. the inferior extremity; B. two lateral openings for the paſſage of the air; C. the ſuperior end of the pipe.

FIG. II.

A ſhort flexible tube for conveying air into the lungs. A. the inferior extremity to be attached to the ſuperior one of the ſilver pipe; B. the other extremity to be connected with the contrivance (Fig. 3. at c.) or attached to Mr. Field's inſtrument (Fig. 4 at e.)

Fig. III.

Repreſents a ſhort conical braſs tube connected with a conical piece of leather, to receive the nozzle of any pair of bellows, and by means of packthread to retain it in its ſituation. a. the braſs; b. the leather portion, c. a female ſcrew to admit the ſuperior extremity of the flexible tube.

Fig. IV.

Mr. Field's inſtrument for inflating and collapſing the lungs. a. is a conical leather tube to be attached to any pair of bellows; b b. is a braſs tube; c. is a ſtopper to the cock in which there are two valves opening in contrary directions; D. is an aperture through which all the air is to paſs to and from the bellows, (the valve of the bellows being previouſly cloſed by another inſtrument repreſented in the next figure); E. the inferior extremity of the braſs tube to be connected with the ſuperior end of the flexible tube, (at B.) When the ſtopper ſtands as is here repreſented with I. (ſignifying inflation) pointing to the inferior extremity of the tube, the lungs will be expanded, and when the ſtopper is turned half round, ſo that C. (meaning collapſe) will be placed in the ſame direction, the lungs will be exhauſted. In the one inſtance by the action of the bellows, air is received at the aperture D. and thrown into the lungs, but prevented from regurgitating on account of the valve.

In the other, air will be received from the lungs into the bellows, and thrown out at the aperture D.

FIG. V.

Is the invention for cloſing the valve of any bellows. A A. is a piece of iron to be inſerted into the valve-hole of any bellows, which being placed acroſs, prevents its being drawn out. B. Is a pivot on which the iron part C C turns. D D. is a circular flat piece of wood, (lined with leather,) to cover the valve-hole, with an aperture in its centre, to admit the iron C C. through it. E E is a braſs nut, which is made to ſcrew on the iron C C, to retain the piece of wood in its ſituation.

FIG. VI.

A flexible tube (of the ſame compoſition as flexible catheters) to be introduced into the œſophagus, for conveying ſpirits, &c. into the ſtomach. A. The bulb and inferior extremity. B. the ſuperior. CC. is a conical piece of ivory, to be paſſed a ſmall way down the œſophagus by the fore-finger, to prevent air eſcaping into the ſtomach, and as a guide for the introduction of the ſilver pipe into the glottis, when bronchotomy has not been performed.

FIG. VII.

Is a vegetable bottle, for injecting fluids into the ſtomach through the flexible tube. A. The mouth of the bottle to be attached to the extremity of the flexible tube at B.

FINIS.

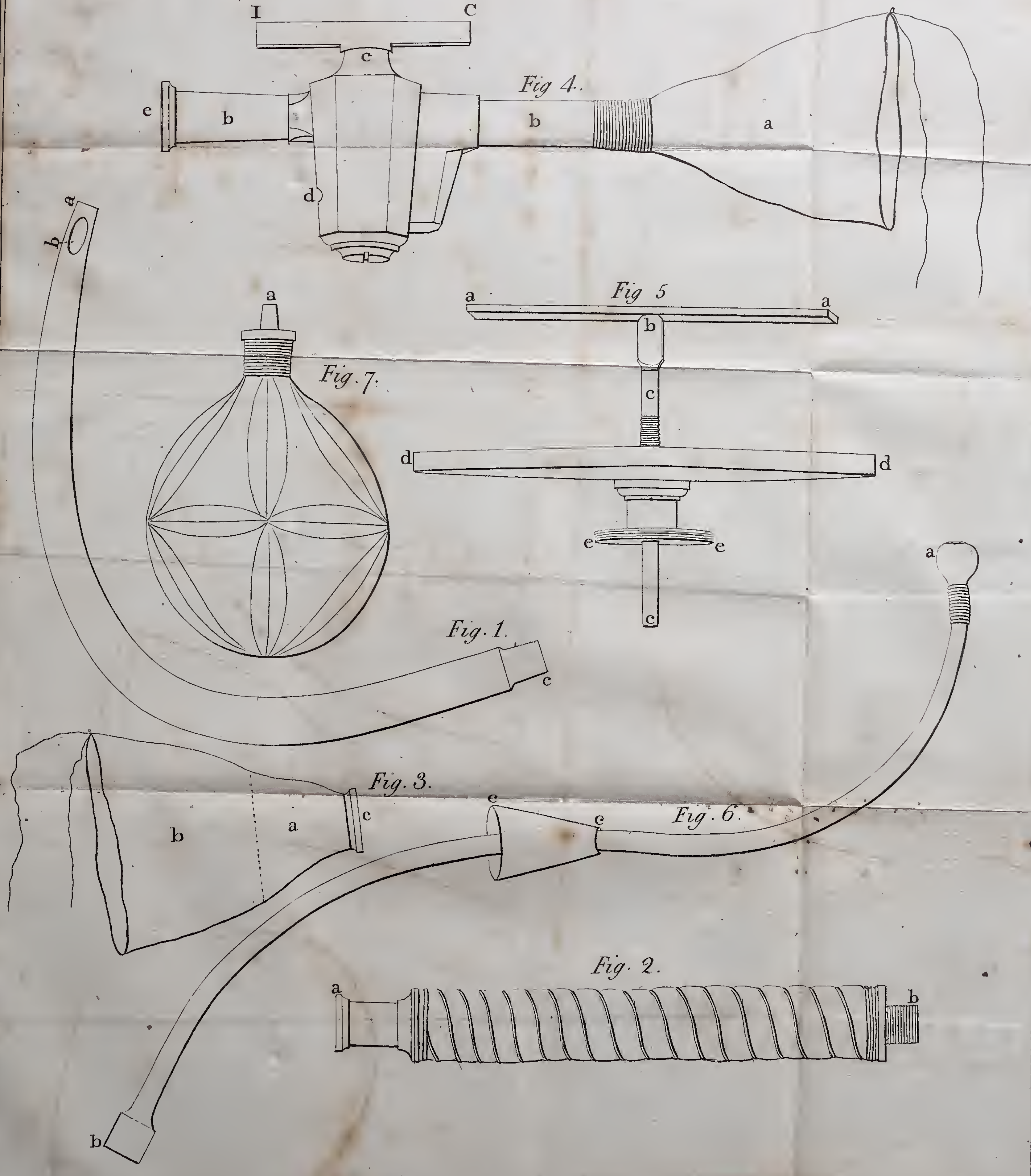
Fig 4.

Fig 5

Fig. 7.

Fig. 1.

Fig. 3.

Fig. 6.

Fig. 2.